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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Dyes and Fine Chemicals

THIS week's issue of THE CHEMICAL AGE is of a special nature and is mainly devoted to Dyes and Fine Chemicals. Our practice of issuing special numbers about once in each month is one which seems to have been whole-heartedly appreciated by our readers, so that—backed by this encouragement—we endeavour to make each special issue an improvement upon its predecessor. There is a good deal to be said for the policy of selecting some specific branch of chemical science and industry and dealing with it to the exclusion of other subjects, for in the period of a year or so all interests should be more or less catered for, and the task of referring back for information is made very much easier. There is no question that the special subjects with which we are on this occasion dealing offer an unexampled opportunity for treatment, and we should be the last to pretend that they could be disposed of in a single issue of a technical journal. We have, however, been fortunate in securing contributions of a highly interesting and original nature from authoritative writers whose spheres of activity are comparatively remote even though they are all working more or less to the same end.

An interesting fact which may be alluded to here is that three of the contributors to this issue are at present engaged in writing volumes for some of the new series of text books which are being published shortly by Benn Brothers. For the "Technical shortly by Benn Brothers. For the "Technical Chemical Series" Dr. S. P. Schotz is engaged on a volume dealing with "Synthetic Organic Compounds," while Mr. Norman Evers, who is well known as chief research chemist to Messrs. Allen and Hanbury, is already well ahead with a volume on "The Chemistry of Drugs and Alkaloids." Mr. H. M. Bunbury, who refers elsewhere to the intimate connection between the wood distillation and dye industries, is one of the few chemists in this country who are able to speak with a close knowledge of the manufacture of products derived from wood, and he has just completed a volume for the "Gas and Fuel" series on "The Destructive Distillation of Wood." In all, these two series of books will run, as a start, to some thirty volumes, the majority of which should be available before the end of next year.

So much has been said and written about the dyestuffs industry in this country, so many conflicting statements have been made, and so much argument has been waged around the subject of the most effective technical and administrative policies to be followed that the average individual who looks on from outside has had little opportunity for summing up the true facts of the situation. In this issue Mr. S. Ellingworth, of the research department of Leeds University, has some suggestive comments to make; and although here and there some of our readers will be disposed to differ from his contentions, there can be no doubt that there is a good deal to be said for the opinions he expresses. As to whether it is preferable to have a business or technical mind at the head of affairs the future must be left to decide. There is much to be said from both standpoints, and Mr. Ellingworth as a technical man does not hesitate to insist that the highest direction of so scientific an industry should be in the hands of those who possess the fullest scientific and technical training and experience. On the other hand, dye-making is a business as well as a science; and in this country the highly scientific mind is, perhaps, rarely found combined with solid business acumen. Accordingly, the only method of arriving at a solution of the problem would seem to be that of experimenting with both forms of control and abiding by the experience of practical results.

The dyestuffs industry is unlike other industries in that from its inception there has been a continuous demand for new and improved colours. In other words, a stage of finality is never reached, for no sooner has one class of colours become firmly established in the public favour than it has been superseded by something of a superior character. Success, in

fact, is largely dependent upon unceasing progress, not only with the finished products but in the way of raw materials and intermediates. In order, therefore, to keep abreast of the times, and to be in a position to meet competition when it arises, the watchword must essentially be "Research and still more research." At the same time every effort should be made to aim at co-operation and the avoidance of exasperating duplication of effort.

Drugs and Alkaloids

Drugs and alkaloids have always been an object of interest to the chemist and physiologist, and for nearly a century scarcely a year has passed which has not witnessed the discovery of one or more of these sub-stances. It has been rightly said that the alkaloids are among the most complex of organic compounds, and their artificial production marks the highest achievement in the domain of organic synthesis. One well-known authority has remarked that "although many of the more complex natural products have not yet been obtained artificially, there is a sufficient array of these substances to warrant the firm belief that what the living animal or plant has accomplished within its own hidden workshop may be imitated by the chemist in the laboratory." Thus, organic synthesis has broken down the last barrier which separated the products of the organic from the inorganic world of matter, and the remarkable developments which have occurred in organic chemistry have for a long time captivated almost every chemist of a constructive turn of mind.

In dealing elsewhere in this issue with the subject of synthetic drugs Professor J. B. Cohen quotes examples to illustrate how a slight change in structure may completely alter the physiological effect, whilst, on the other hand, substances of a totally different constitution may possess almost identical physiological properties. Nevertheless, it is agreed that a certain relation exists between structure and physiological properties; but the relation is by no means well defined owing partly to the complexity of the organism with which the substances are brought in contact, and partly to the physical as well as the chemical nature of the substances. It is, therefore, only when clearer views obtain on this subject that chemists will be able to work with the certainty of obtaining results upon which they have embarked. At the moment we can, in fact, only claim to be in the empiric stage. A point worthy of particular notice which emerges from the article of Mr. Norman Evers is that, whereas we may more or less succeed in imitating the products of nature, only in a few cases have alkaloidal derivatives prepared in the laboratory been found to have a superior value in medicine to the natural alkaloids. In fact, the tendency in medicine has, of late years, been to "return to nature," and to use the natural drug rather than the synthesised product.

Business Men and the Election

Mr. Lloyd George has resigned and Mr. Bonar Law was on Monday received by the King and undertook to form an administration. The new Premier advised the dissolution of Parliament, which took place on Thursday. The polling will take place on Wednesday,

November 15, and Parliament will reassemble on Monday, November 20. Between now and the middle of November politicians of all shades of opinion will be appealing to the electorate and leaders will be framing their policies. Party politics are not within the scope of THE CHEMICAL AGE, and the foregoing information is a matter of general knowledge, but as we represent in this journal the views of a large section of the business community, we would, on their behalf, remind the leaders of all parties of what has taken place during the past ten years. The business people of this country, those men who, although they do not act as figure-heads, are in reality the back-bone of the State, have during the past few years been enlisted, demobilised, rationed, income taxed, corporation taxed, excess profits taxed, and super taxed. They have been called upon to fill up forms till it reached a point when shell-filling and form-filling tended to become the only national industries, and while maintaining a wonderful good humour through all these distressing circumstances they really feel that they have had enough of it. If the new Parliament will get quietly elected and then proceed to a period of masterly inactivity during the time of recuperation, the business community may have a chance to set the country on its feet again. Any programme of any leader of any party which necessitates the spending of money will be suspect. This must be pretty plain from the events of the past few days. The average man did not care a straw about the rights and wrongs of the action taken in the Dardanelleswhat he did care about was that it was likely to cost a good deal of money, and as he is determined that taxation should be lessened rather than increased he was influenced by the finance of the proposal and as a result would have nothing to do with it. Politicians with their adventures and the permanent officials necessary to carry them through are costing the country far too much money, and whatever the complexion of the new Government, it will be attacked from the first day of its existence unless it shows a ruthless determination to cut down expenditure and taxation.

A Chemist's Economics

PROFESSOR SODDY is a chemist who has done great service in advancing knowledge. His work is of firstrate importance in chemistry, but it is doubtful whether his views on economics will be as valuable as his experimental work on radio-active substances. His pamphlet on what he calls Cartesian Economics is, like most of his other publications, well written and much of it is worth reading, but as a practical guide to present-day conduct, it seems, perhaps, to be a little misleading. That part of it which is philosophical and metaphysical or ethical is not of great importance; most of us realise, though we cannot express our ideas as lucidly as Professor Soddy, the disadvantages of our capitalistic system. He points out very truly that we are now living, not only on the yearly produce of the world but on the accumulative riches or energy stored up in by-gone days in the form of coal and other materials, and that we are rapidly consuming this capital.

It is when we come to his suggestions and his advice that we find ourselves opposed to his views. His scheme for printing paper money—we suppose in each country—so as to keep pace with the prices of commodities in the country appears to us to be unsound, if not fantastic. His distinction between the welfare of the community and that of its creditors seems to be founded on a fallacy. His remarks on investors as usurers are scarcely to the point. Suppose they are usurers—what then? The question is whether it is to the advantage of the community that investors should exist and continue to invest their surplus. Professor Soddy states that it is impossible to save, and he brings forward some paradoxical statements which prove that, in his meaning of the word "save," the statement is true. But as ordinary people use the word the statement is untrue. Every individual or almost every individual can save, and at the present time and in this country the more he saves the better.

If next year some usurers, as Professor Soddy calls them, could set up a large and profitable works in Birmingham or Newcastle, would they confer a benefit on this country or would they be causing it harm by using up more coal, more money and so on? This is the question that has to be answered, and the chemical and thermodynamical laws he calls in to prove his case do not help him to answer it in a manner which will appeal to those who have to make the decision. If Professor Soddy were concerned in the organisation of such a works would he rather have 200,000 shareholders of £5 each, or 1,000 shareholders of £1,000 each? The man or the company or the combination of companies who can, in a few minutes, decide whether he or they will or will not procure a large amount of capital or credit—it matters not what name it has—is a valuable unit in present communities. What will be the position five hundred years hence we do not know, any more than a man living in 1422 would have been able to legislate for our present needs.

The Modification of Scientific Theories

AT Leeds University, on Monday, Sir Arthur Schuster, in what he described as the last lecture he intended to deliver, contrasted the spirit of science to-day with that of his youth, and very aptly recalled the fact that fifty years ago it was generally assumed that science had crystallised. The great facts of science were thought to have been discovered, and it was believed that all that remained to be done was to work out some minor details and add another decimal place to some physical constant. To-day, however, the old conceptions of scientific theories as definite and incontrovertible laws no longer held, although it was impossible to gain information on some subjects even in the light of modern knowledge without reference to some old theories that were in process of being dis-The moral to be deduced from Sir Arthur Schuster's remarks is that the progressiveness of science must apparently be eternal and that, in the light of new discovery, the most soundly established law must prove mutable. In this connection, however, it should be remembered that although the views of such men as Boyle, Lavoisier, Dalton, and others have been corrected by experience and broadened

by extended knowledge, the fundamental truth of some of their discoveries remains unchallenged. The recent controversy in The Chemical Age on the problem of solution showed in no uncertain manner that some of those who twenty years ago were among the supporters of Ostwald have now been compelled to modify their attitude. It is quite within the bounds of possibility that many of the laws which are generally accepted to-day will, in another hundred years, be modified or even discarded. Absolute finality must ever remain ahead, but relative truth can age by age be made more certain.

Points from Our News Pages

- Special articles dealing with dyestuffs, and fine chemicals are contributed by S. Ellingworth, S. P. Schotz, Norman Evers, H. M. Bunbury, J. B. Cohen, and C. Collins (pp. 588-604).
- The substance is given of the Referee's award on gallic acid (p. 604).
- A summary is published of Professor T. M. Lowry's paper on
- the polarity of double bonds (p. 604).

 The International Metallurgical and Chemical Society announces that it is offering three research medallions
- (p. 666).
 The forthcoming retirement of Professor Smithells is announced
- (p. 607). A fair volume of business with the consumptive demand fairly well maintained is notified in our London market
- report (p. 613).

 According to our Scottish market report, there has been very little change in the position during the past week, the amount of business booked still being moderate (p. 615).

Books Received

- A LABORATORY HANDBOOK OF BIO-CHEMISTRY. By P. C Ra ment and G. L. Peskett. London: Edward Arnold and Co. Pp. 102. 58
- By Edward E. Price. London: Longmans, ATOMIC FORM.
- Green and Co. Pp. 148. 5s.

 LA CHIMIE DES COMPLEXES INORGANIQUES. By Robert Schwarz. Paris: Dunod, Editeur. Pp. 70.

 REPORT OF THE FOOD INVESTIGATION BOARD FOR THE YEAR
- 1921. By the Department of Scientific and Industrial Research. London: H.M. Stationery Office. Pp. 47.2s.

The Calendar

Oct.		76 1
28	The West Yorkshire Metallurgi- cal Society. Paper by T. E.	George Hotel, Hud- dersfield.
	Hull. 6.30 p.m.	70: 1 1-
30	University of Birmingham Chemical Society. "The Quan- tum Theory and its Application to Chemistry." A. R. Bowen,	Birmingham.
	Esq.	
30	Institute of Chemistry (Man- chester Section). Annual General Meeting. 7 p.m.	Grand Hotel, Man- chester.
31	Hull Chemical and Engineering Society. "Crude MincralEarths found in the Via Grellia Valley." W. Allsebrook. 7.30 p.m.	The Hull Photo- graphic Society's Rooms, Park Street Hull.
Nov.	, 5 1	
x	Society of Public Analysts. Or- dinary Meeting. 8 p.m.	Burlington House, Piccadilly, W.1.
2	The Chemical Society. Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly.
3	Society of Chemical Industry	Textile Institute,16,

St. Mary's Parson-

age, Manchester.

(Manchester Section). "Isoto-

pes." Dr. F. W. Aston. 7 p.m.

The Position of the Dyestuffs Industry

By S. Ellingworth, M.Sc.

Much has been said and written concerning the dyestuffs industry in this country, and criticism of its progress and control has been plentiful. Probably no branch of chemical technology has aroused so much interest in the public mind, though it is possible that comparatively few of the essentials for the successful re-establishment of the industry in this country are generally understood.

IT was obviously absurd to expect that the newly-formed dye-making concerns of Britain, France and America would be in a position at the close of hostilities to compete on equal terms with the great German organisations, backed by their huge resources and long experience.

Some of the new companies, at any rate, had been compelled to concentrate their energies on the manufacture of explosives, and the production of dyestuffs was of necessity a matter of second-rate importance. During the later war years it was difficult and even impossible to obtain the supplies of material necessary for the erection of plant. Nevertheless, considerable progress was made, particularly in the production of valuable intermediates which had formerly almost invariably been imported.

Materials such as paranitraniline, β-naphthol, benzidine and several of the amino and hydroxy naphthalene sulphonic acids, all of good quality, were turned out on a scale never previously attempted outside Germany, and as these multiplied a constantly increasing range of colouring matters became available. The plants erected were thoroughly efficient and up-to-date, though, as will be mentioned later, it is to be feared that many were somewhat too generous in size and capacity for production.

size and capacity for production.

The unfortunate difficulties in which colour manufacturers at present find themselves may be said to have begun with the delivery of the Sankey judgment, consequent upon which large quantities of foreign colours were imported and oftered for sale at prices with which, owing to the rates of exchange and the high cost of materials and labour in this country, home manufacturers were quite unable to compete.

This in itself was no reflection on our own producers, who had had but a few months in which to devote their whole energies to the perfecting of their wares. It is undoubted that in many, or even most, cases the imported material was superior in quality to the corresponding British article, but of course the former was the product of fifty years of research and experience. The conditions under which the German manufacturers built up their industry were somewhat more favourable than those enjoyed by our own concerns. The foreign companies were generously assisted by the State to develop their plans at a time when labour and materials were comparatively cheap and serious competition was entirely absent. They were able to set up their own standard of excellence under almost ideal circumstances, a standard which British manufacturers were expected to equal in the face of incomparably greater obstacles.

The Dyestuffs Act

On the other hand, the efforts of the British Government to foster the newly-born industry, which, it averred, was of supreme national importance, were altogether different in character. The introduction of the Dyestuffs Act (1920) was delayed until after the importation had been permitted of more than twelve months' normal supply of dyes, at a period when consumption was very much below normal. Even then the Government itself continued to import considerable quantities of "reparation" dyes from Germany. Moreover, the Development Committee set up under the Act adopted a policy which, in the opinion of the writer, was by no means the best method of ensuring the future success of the industry. This question will be discussed later.

It should also be pointed out that the passing of this Act has enormously increased the trouble and expense of obtaining certain materials (which happen to be classed as dye intermediates) in very small quantities for research work; and upon the foundation of pure research the future colour industry must be built

Mention of this leads to another point, the importance of which is perhaps not always appreciated—namely, the difficulties attendant upon the successful transference to the works

of an apparently faultless laboratory process. It has been stated that the German firms frequently do not market a colour until two or three years have elapsed after its discovery in the laboratory. Mechanical conditions, different materials used in plant construction with different conductivities of heat, variation between day to day atmospheric temperatures, different rates of heating and cooling, slower transference of liquids, and slower filtration, are all factors quite apart from the chemistry of a process which may render it quite unworkable on a large scale, though perfectly satisfactory when performed in glass vessels in the laboratory. In this connection it is obvious that the closest and most continuous co-operation should exist between the chemists responsible for a process and those entrusted with the design and erection of plant, a state of affairs which has probably not always been realised.

It should further be borne in mind that the consistent production of colour to match an exact type as demanded by colour users involves the most precise and careful manipulation of every step of a process. Brightness of shade, for example, is an exceedingly delicate test for a commercial product, and involves the greatest accuracy and uniformity in manufacture, not only of the finished material but also of every intermediate stage. The importance of this cannot be over-emphasised, and is perhaps somewhat under-rated within as well as without the colour industry in this country.

Improvement of Colours

Disappointment has frequently been expressed at the small number of new dyes actually introduced by British manufacturers, and it has to be confessed that most of the progress achieved has been almost entirely along the lines of re-discovering methods of production of well-known pre-war dyestuffs. Colour makers have been accused of looking solely for immediate profits and of neglecting the larger and longer view of a great national industry securely established by the greater variety and superior quality of its productions. There is something to be said, however, in favour of the policy the dye producers have adopted. After all, a large industrial concern, in the absence of very substantial financial assistance from outside, can only be maintained by the profits derived from its sales, and this fact, coupled with the persistent demands of consumers for many of the well-known and widely used pre-war dyes, affords at any rate some justification for the lines along which manufacturers have proceeded. It is also of interest to note that the Development Committee, instituted under the Dyestuffs Act (1920), has deliberately adopted the course of endeavouring to stimulate work on the improvement of colours already being made in this country in order to bring them up to the standard of quality reached by foreign materials rather than to encourage attempts to produce new and wider ranges of dyestuffs.

The opinion has also been expressed that there is hardly adequate justification for the enormous range of colours demanded by consumers in pre-war days, and it has been argued that all reasonable requirements could satisfactorily be met by such a smaller range of the better materials, on which manufacturers should concentrate their energies. On the other hand, the present period of trade depression and overproduction is held by some to favour a progressive policy, enabling manufacturers to devote a measure of attention to new fields of investigation which would be impossible with greater demands made on their producing capacity. It is most unfortunate in this connection that the acute financial stringency which the slump has forced upon many firms has led to extensive closing down of plant, and to a wholesale disbandment of research and technical staffs, many of whom have served an invaluable apprenticeship in the special work of the colour industry in addition to their previous scientific training and experience.

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However, if it is true that few new materials have been produced, quite a creditable range of useful colours is now made and marketed by British firms, and a very notable display was shown by the various concerns at the British Industries Fair held during this year. The latest list of the British Dyestuffs Corporation, Ltd., contains a wide range of dyes of all classes, including many of the more complicated and better class products. Such articles as the Gallocyanines, Patent Blue, Turquoise Blue, Alizarin Saphirol, Duranthrene Brilliant Violet, together with many lake colours, are now available, and it is further claimed that an entirely new series of colours has been discovered peculiarly suited to the dyeing of artificial silk. A further series of dyestuffs has been prepared, to which solubility is imparted by the presence of an alcoholic sulphuric acid group—CH₂O.SO₃H, attached to nitrogen. This—SO₄H group is termed a "sulphato" group, and may be introduced in a variety of ways into either dyestuffs or intermediates. products, of course, are acid colours and dye wool and silk from an acid bath.

Hydroxyalkyl derivatives of oxazine, azine, and thiazine

dyestuffs have also been obtained.

In the realm of intermediates, new methods have been employed for the production of 1 chloro 2 amino anthraquinone, ortho sulphonic acids of aromatic amines, and phenyl glycine compounds.

Difficulties of Manufacture

Very creditable efforts have been made by Scottish Dyes. Ltd., in producing quite a range of the valuable acid Alizarin and Indanthrene colours, materials which involve considerable difficulty in manufacture. Amino anthraquinones have been made in improved yield and quality by heating the corresponding chloro derivatives with aqueous ammonia under pressure, especially in the presence of small amounts of copper sal.s. Improved methods of manufacture of oxy-derivatives of anthraquinone have been introduced, whereas by the treatment of the oxidation product of dibenzanthrone with dimethyl sulphate vat dyes have been produced giving on cotton brilliant greenish blue shades of excellent fastness to chlorine, acids, and

The British Alizarin Co. has produced a range of dyes of excellent quality of the class denoted by their name, and other British manufacturers have almost all in like manner increased

the range of their products.

Regardin, the dye industry abroad, it may be said generally that all manufacturers have felt the effect of the difficult economic conditions which everywhere prevail.

In America considerable progress has been made, mostly, as in England, on the lines of re-producing well-known pre-war dyes, but the effects of post-war international finance have made their mark, and the Government has deemed it advisable to introduce a certain measure of protective legislation. Several of the largest concerns have amalgamated, and some success has been achieved in the creation of an export trade. In this connection it is noteworthy that machinery has been set in motion by the Government with the object of assisting manufacturers to find the most promising markets for their products.

Difficulty has been encountered in the production of vat dyes, owing to an insufficient supply of anthracene. This is in turn due to the difficulty of disposing of the hard pitch which remains after removal of the anthracene from the tar. Certain improvements have been introduced in the methods of separating and purifying anthracene and anthraquinone.

An interesting and noteworthy feature of the development of the industry in America has been the part played by the American Chemical Society, which, as a united body representing both the scientific and industrial branches of chemical activity, has been able to exert considerable influence in Government circles on behalf of the colour makers.

The Swiss Dye Industry

The principal exporters of dyestuffs to America have been the Swiss, whose colour industry is, of course, well established. Aninteresting review of the Swiss chemical industry has recently appeared (Journal of the Society of Chemical Industry, 1922, 113 R), where it is stated that Swiss dyestuffs have attained pre-war standard in both quality and variety.

This is largely due to the fact that throughout the period of depression manufacturers have succeeded in maintaining their entire technical and research staffs, amongst whom, more-

over, a very high standard of efficiency obtains. Practically all the chemists at the Basle works have enjoyed athorough University training, and have obtained their D.Sc. or Ph.D. degree. Such a happy state of affairs promises very well for the future of the industry. Whereas new dyes have been brought out, new fields have been touched in the production of photographic and pharmaceutical materials, and if exports to America and European countries have fallen owing to the various embargoes in force, it is said that India and the East, free export to which has been described as the "touchstone of efficiency in the industry," are providing new outlets for the activities of Swiss dye makers.

A considerable variety of colours are made, noteworthy amongst which are the Ciba range of direct colours fast to light, the Sandoz range of alizarin-acid colours, and the wellknown standard products (Erio-chrome colours) of Geigy.

New and easily soluble diazotisable azo dyes have been introduced in which the introduction of N-methyl ω-sulphonic acid residues into substantive azo dyes containing a diazotisable amino group is said to increase the solubility without alteration of the dyeing properties.

Acid wool dyes yielding very fast and even blue to grey shades have been obtained when mordant dyestuffs of the constitution R.N: NR1 where R signifies a 2-hydroxynaphthalene 4 sulphonic acid residue and R^1 a halogenated α naphthol residue, are treated with an agent capable of yielding chromium. In spite of the high value of Swiss currency, it was stated

early this year that Swiss quotations were only about 5 per cent. above the German prices and 30-50 per cent, under those of the Allied countries.

In France home manufacturers were stated during 1921 to be producing one-half of the colouring matters consumed, compared with less than 7.5 per cent. in 1913.

Efforts have been made to establish a dye-making industry

in Japan, but have failed through lack of the necessary

in Japan, but have tailed through lack of the heurosaly technical knowledge, and shortage of essential intermediates. Large imports have, in addition, overstocked the market.

It has recently been announced that two new companies have erected dye-making plants in Canada, most of whose necessities have previously been supplied by the United States, Britain, and Germany.

The German industry has, of course, been affected by the political and financial disturbances in that country, as well as by an interrupted fuel supply. Protective measures intro-duced by other countries have also had their effect in reducing the export trade. Perusal, however, of recent patent literature suggests that continued activity prevails in the field of research, and there can be little doubt that when international affairs have once more become adjusted, the German firms will still be the most formidable competitors of the newer sections of

Considerable attention has been given to the production of new and somewhat complex azo dyestuffs.

Monoazo dyes of the general formula OH . C_0H_3 . (4) (6) $(NO_2)_2$. (2) $N_2.C_0H_2$ (2) OH. (3) NHR, (5) CH_3 (R=acidic group) are derived from diazotised picramic acid and 2-R-amino 4 methylphenol. An azo dyestuff is claimed, having the formula NH C_2H_3O , C_6H_2 (2) OCH $_3$ -. (5) SO $_3$ H . -(4) N $_2$ (1) C $_{10}H_4$ (2) NH $_2$. (6) SO $_3$ H (8) OH which dyes a bluish red shade on wool.

A further colour of this class is obtained by coupling 3.4.6 A further colour of this class is obtained by coupling 3.4.6 trichloro-2 diazo. I hydroxy benzene with I acetylamino-8-hydroxynaphthalene 4 sulphonic acid. This is stated to give blue shades of good fastness on chromed wool, or on unmordanted wool by means of the top-chroming and metachrome methods

Materials dyeing level bluish red shades on wool, fast to light and milling, are obtained by diazotising alkyl, aryl, or aralkyl derivatives of 4 nitro 1 amino benzene 2 sulphonamide and coupling with 2 amino 8 naphthol 6 sulphonic acid in acid solution, the nitro group being afterwards reduced with alkaline reducing agents.

Sulphonic acids of the azo dyes derived from diazotised aromatic o-hydroxyamino compounds and a monohydroxy derivative of quinoline yield bordeaux to violet-brown shades on chrome mordanted wool.

New dyestuffs having great affinity for cotton, and giving very clear shades, fast to light and ironing, are obtained by combining I molecule of 5.51 dihydroxy, 2.21 dinaphthylamine, $7^{\circ}7^{1}$ disulphonic acid with 1 or 2 molecules of o-amino benzoic acid or its derivatives, and treatment of the products with solutions of copper salts.

A new series of secondary o-hydroxy disazo dyestuffs has been prepared which are claimed to yield level brown, green, violet and black shades when after-chromed on wool. These colours are said to be fast to milling, potting, light, and carbonising. They are obtained by coupling diazotised aminohydroxynaphthalenes with azo components, and again coupling the products with o-diazo phenols.

Trisazo dyes of the probable formula

 $\begin{array}{c} \text{(3) SO}_{3}\text{H. } C_{8}\text{H}_{4}\text{N}_{2}\text{ (1) } C_{10}\text{H}_{6}\text{ : (4) N}_{2}\text{ (1) } C_{10}\text{H}_{5}\text{ : (6) SO}_{3}\text{H.} \\ \text{(4) N}_{2}\text{ (2) } C_{10}\text{H}_{4}\text{ (1) OH. (3) SO}_{3}\text{H. (7) NH}_{2} \end{array} .$

are claimed which dye reddish blue shades on cotton, and after diazotisation on the fibre and coupling with β naphthol or m toluylene diamine yield bluish grey shades.

In the triphenyl methane class a series has been introduced which can be after-chromed. They dye reddish brown shades, changing to blue or bluish-green by after-chroming.

The anthraquinone series has also received attention. Derivatives of thiazoleanthrone have been obtained, which dye cotton blue shades in the vat, oxidising in the air to yellow shades fast to chlorine. Sulphonated derivatives of these dye wool direct and cotton yellow shades from a blue vat. New intermediates of the type

$$C_6H_4$$
 CO
 C_6H_3
 N
 O
 C
 R

have been proposed, and improved methods have been patented for the manufacture of arylamino anthraquinone derivatives.

Cyclic ketones of the quinoline type-

are said to be suitable intermediates for dye production.

Sulphur dyestuffs have been obtained, some of which, containing a sulphonic or carboxylic acid group, can be dyed and printed in the usual manner for acid dyes. Others, which do not contain an acid group are vat dyestuffs, which on after-treatment with chromium or other metallic salts, yield fast green to black shades.

Derivatives of the accidine series have also been obtained, and are claimed to be specially applicable to leather dyeing.

and are claimed to be specially applicable to leather dyeing.

Further details of recent work, both scientific and industrial, connected with all phases of colour making, are to be found in the very comprehensive Annual Reports on the Progress of Applied Chemistry issued by the Society of Chemical Industry.

The Question of Over-production

Returning again to consideration of the British colour industry, one is led to ask, "What of the future?" One cannot but wonder whether, in the face of such world-wide activities, permanent troubles will occur owing to overproduction, even with consumption at its normal rate. Germany alone, it should be remembered, has sufficient resources to supply three-fourths of the pre-war demand. It is certainly difficult to conceive how some of the huge plants erected in this country, for instance, can ever be worked economically, and one is forced to the conclusion that somewhat extravagant views of future possibilities have influenced those responsible for their construction.

But, apart from this consideration, the writer is most strongly of the opinion that, if our home producers are to have any hope of permanent success, their motto must always

be "unceasing progress."

The whole history of the colour industry right from its inception has shown that the demand for new and improved dyes is unchanging. No sooner has one class of colours become firmly established in the public favour than it has been attacked and superseded by something different, and usually something superior. There is no reason to suppose that such a process is at an end. The tendency still exists

to use better and more expensive dyestuffs. Indigo and alizarin, to quote only two examples of colours long regarded as standard, are now meeting with serious competition, and the same may be said of almost every other colouring matter. There is no finality about the dyestuffs business.

"Unceasing progress" means, in the first place "unceasing research." Dyestuff research may proceed along three lines: (a) Improvement of existing processes of manufacture of known materials, leading to products of greater purity; (b) discovery of new members of known classes of colours; (c) discovery of new classes of dyes with new and superior dyeing properties. Too much stress cannot be laid upon the desirability of attaining the highest standard of quality from raw material to finished article. The writer has known instances in which the presence of less than 5 per cent. of impurity in the raw material of a process has reduced the yield at a later stage by 50 per cent. of the total, or has even obliterated it altogether. Purity of raw materials and intermediates not only means better dyestuffs, but is sound economy.

Considerable as has been the progress in the past, much greater efforts will be essential in the future. If the Government and the public believe that a healthy dye industry is a national necessity, both must be educated to realise that liberal assistance and encouragement, financial and otherwise, must be granted to enable the all-important research work to be carried on.

The Question of Control

But it is equally important that the best use should be made of such assistance. It should clearly be recognised that the highest direction of an industry so highly scientific and technical must be in the hands of men who possess the fullest scientific and technical training and experience, and should not be entrusted merely to "business" men. The truth of this dictum has been amply demonstrated by the success of the German concerns, yet despite its persistent reiteration by many authorities ever since the inception of the new attempt to establish the industry in Britain, the old fatal policy still persists, and in many instances technical staffs are subject to the control of men who can have no real appreciation and understanding of the problems peculiar to their enterprise. Quite recently the President of the Board of Trade, when questioned concerning the dyestuff industry, conveyed the illuminating information that "it was not considered essential that technical men should be at the head of a great business concern." But dye-making is science as well as "business," and real success will never be achieved until the reverse opinion and policy is adopted.

Organisation within the industry should be such that unnecessary and useless duplication of difficult research work is avoided, especially within the laboratories of the same concern. Such repetition is unprofitable to the manufacturer, and exasperating to the chemist. Waste of energy and material should also be avoided by the closest co-operation between all departments concerned in the discovery, production, testing, and marketing of the products.

The utilisation of waste products and surplus energy by the development of side lines should receive consideration, but should be kept in its proper relationship as an enterprise subsidiary to the main purpose of colour production.

Finally, the aim of each individual member of a colour works staff must be directed consistently to one end, namely, that of co-operating with his colleagues to ensure the progress of the concern. The manufacturer who, by his methods and organisation, is able firmly to establish this spirit in the minds of his staff and employees is already well advanced along the road to success.

Sale of Dangerous Drugs

Two partners in the firm of Dalrymple and Banks, whole-sale druggists and manufacturing chemists of Liverpool have been fined froe each for failure to make entry of the sale and purchase of dangerous drugs, failure to keep them under lock and key, and failure to keep a register of the drugs in stock on some part of the premises ready at all times for inspection. Some of the drugs were found on the office floor, open to employees, and others were in an unlocked cupboard amongst stationery. There was no suggestion of illicit dealing in drugs or wrongful disposal.

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Developing the Fine Chemical Industry

By Dr. S. P. Schotz, F.I.C.

It will be a matter of interest for our readers to learn that Dr. Schotz is engaged in writing a volume on "Synthetic Organic Chemicals" for Benn Brothers' "Technical Chemical Series." Below he deals with a branch of chemical industry of which he has made a particular study, and shows how several remarkable discoveries could be followed up so as to give innumerable novel substances with the aid of methods which permit of mass production and cheapness.

What is a fine chemical? This question has been battled before the Official Referee without any definite conclusions. Indeed, it appears impossible to give a general answer. Such definitions depend on the existing state of science, general education, and industrial development; and, therefore, under the most favourable circumstances can only be transient. To Faraday, benzol was a fine chemical; yet no advocate of the Key Industries Bill would class commercial benzol as such. Our cane sugar would have been regarded by our forefathers also as a fine chemical. For the purposes of this article a fine chemical will be defined as a substance which is chemically uniform, prepared by methods which are not generally known or have not been sufficiently studied or require much scientific skill.

There are millions more of important chemicals to be discovered than have ever been produced; and the royal road to success, no doubt, lies in the direction of independent enterprise rather than copying All successful branches of British chemical industry have developed on the lines of mass production. Perhaps, therefore, chances of great achievement must be looked for among chemicals which can be manufactured and applied in large quantities and which can be produced by methods which allow subsidiary manufactures to be carried out by means of the same plant. We can roughly class these methods under the following headings: Catalytic, Electro-lytic, and the so-called Fermentation processes in which micro-organisms are utilised for the formation of new materials.

Catalytic Processes

Hardly any process of synthetic organic chemistry of the last twenty years has had such effect on mass production as the discoveries of Sabatier and Senderens. The first reaction studied by these scientists was the hydrogenation or reduction of organic substances by means of hydrogen and metallic nickel. This method has gradually evolved such highly important processes as hardening of fats, cracking of petroleum with production of fully saturated hydrocarbons, etc. As a logical sequence there followed a method which is the reverse of the foregoing, namely, dehydrogenation. Further, it was found that :-

1. Oxygen in presence of copper can effect oxidation.

2. The elements of water can be removed from alcohols, e.g., ethyl alcohol when passed over alumina heated to 230° C.
gives ether, while at 360° C. ethylene results.
3. In presence of thoria amines are produced from alcohol

and ammonia.

4. Esters can successfully be prepared by passing a mixture of alcohol and acid over heated thoria or titanium dioxide.

5. Acetone and diethylketone are obtained on passing acetic and propionic acid respectively over hot manganous oxide.*

We are hardly yet in a position fully to realise what addition to the number of definite pure chemicals this group of methods is going to give us. Consider the case of phenol. By reduction one obtains cyclohexanol, which is endowed with interesting properties as a solvent.† It can be esterified with all kinds of acids, in many cases catalytically; moreover, it can be oxidised to the ketone, cyclohexanone, which in its turn reacts with hydroxylamine, hydrazine, etc. All these reactions give excellent yields, and the resulting substances will, no doubt, be found to possess interesting properties. Cyclohexanone is also remarkable for reacting with potassium cyanide. The addition compound, as well, is capable of entering numerous transformations. As can readily be seen, a single substance could easily form the basis of a new branch of industry.

* For further details the reader is referred to the classical treatise on this fascinating subject, Catalysis in Industrial Chemistry, by G. G. Henderson.

† "A Cyclohexanol Discovery," The Chemical Age, August 5,

1922, page 163.

How a number of such reactions can be utilised for the manufacture of a single substance has been shown in Matthews' Syn'hesis of Rubber,* with isoprene as an intermediate substance. Isoprene on being kept in contact with metallic sodium was converted into rubber. An inspection of the formula of isoprene makes one wonder if polymerisation could not be effected at the buston. This has been done bust testing. not be effected step by step. This has been done by treating isoprene with special catalysts when a terpene-like hydrocarbon is produced. Probably many terpenes will be synthesised by similar simple methods. Synthetic rubber has so far not proved a commercial proposition. Yet a process on these lines must finally succeed, in which case the chemical industry will gain access to all intermediate substances, which necessarily will be cheap, and some of which will form the nucleus of fresh manufactures.

Indiscussing catalytic reactions, one cannot omit mentioning the important synthesis of an acetaldehyde and acetic acid from acetylene by means of mercury salts. From acetaldehyde, of course, alcohol can be made by a simple reduction. Numerous patents dealing with these processes have been taken out, and large concerns are actively engaged in the manufacture. Acetylene is obtained from calcium carbide and the latter from carbon and lime. A number of valuable organic chemicals are, therefore, produced from the elements—one of the great aspirations of the nineteenth century.

Photocatalysis

That light could effect or influence various reactions has been known for a long time, and some little use was made of this knowledge; but the greatest credit is due to Baly, Heilbron and co-workers† for synthesising formaldehyde, sugars, pyridine, and some alkaloids from carbonic acid, water, and nitrites by means of light. Photochemistry is now waiting for the evolution of a method which will make it an efficient and economical means for synthetic processes.

Electrochemical Processes

The fine chemical industry has so far benefited from electrolytic reactions by the preparation of pure metals and per-salts, where frequently these are the best processes. In technical organic chemistry electrical methods have found little applica-To account for this we must realise that all technical work is preceded by suitable researches; but research work in this branch of chemistry has been retarded by two factors. In the first place, the rig-out of a suitable laboratory is very expensive; in the second place, the writings of the scientists in this subject are likely to deter a budding genius from taking it up seriously. Just read how an earthenware pot, acting as a porous partition in an electrosynthesis, has to be cleaned, and give up all thought of research! It is quite possible that this fear of traces of impurities is somewhat exaggerated and that certain cases in which minute quantities of foreign bodies had an adverse effect are exceptions rather than the rule. Electrolytic reductions and oxidations possess the advantage that, by merely altering the potentials, reactions can be made to go step by step, as has been demonstrated in the case of caffeine. It is well known that the substitution, say, of a death of the case of the ca double bond for a single bond and vice versa frequently alters the whole character of a substance and its physiological properties. Therefore, it becomes apparent what a wide field of fruitful work is available in this line of chemical technology.

Ring Formations and Transformations

For the preparation of complicated substances, including the alkaloids, none of recent years have proved more promising than the experiments of R. Robinson and Collie. Let us deal

^{*}W. H. Perkin, J.S.C.I., 1912, 31, page 616. † Trans., 1921, 119, page 1025; 1922, 121, page 1078.

in the first place with Robinson's synthesis of tropinone. The reader may remember that tropinone has been previously synthesised by Willstätter by preparing one from the other the following series of compounds: calcium suberate -> suberone suberyl alcohol suberyl iodide cycloheptene dibromocycloheptane → reaction product with dimethylamine and two equally unimportant products → cycloheptadiene two more compounds \rightarrow cycloheptatriene \rightarrow monohydrobromide of cycloheptatriene \rightarrow α -methyl-tropidine. From this in turn five more substances were made. The last gives tropidine, which was the starting-point of four more compounds, the final product being tropinone. In all, a chain of some two dozen substances had to be prepared before tropinone was obtained. It will be realised what a tremendous task this synthesis meant and what a small percentage of tropinone was finally obtained, as the yields are far from those calculated. Indeed, it took years of labour and the assistance of many enthusiastic co-

R. Robinson set about the same problem in quite a different anner. While analysing the formula of tropinone he observed that it was symmetrically made up from a succinyl radical, a methylamine nucleus and an acetone group, thus :

To test his ideas, Robinson allowed an equimolecular solution of succindialdehyde, acetone and methylamine to stand for half an hour when tropinone was found to be present.* reaction can be modified by substituting for acetone substances related to it with excellent results. It is to be regretted that so far as Britain is concerned Robinson's discovery has remained a dead letter, while on the Continent it was immediately followed up. Thus, we find a patent taken by E. Merck and O. Wolfes (Eng. Patent 153,917), according to which tropinone monocarboxylic ester is obtained by condensation of succindialdehyde, methylamine and acetoacetic ester. The last substance can be regarded as an acetone derivative CH₃.CO.CH₂.COOC₂H₅ and, indeed, gives acetone on treatment with dilute alkalis and acids.

· Collie's interesting work on the polyketides, which was carried out ten years before is closely related to that of Robin-The polyketides are a class of substances derived from keten or its polymerides with addition of the elements of water or other groups.

Keten (melting-point, -151°C., boiling point, -56°C.) is a pungent gas slowly polymerising at ordinary temperature. Liquefied keten is converted into diketocyclobutane at o° C. with evolution of heat,† When passed into water keten gives acetic acid-

$$CH_2: CO + H_2O = CH_3.COOH;$$

with alcohol it gives ethylacetate-

$$CH_3: CO + C_2H_5OH = CH_3.COOC_2H_5$$
;

with hydrochloric acid acetyl chloride is obtained-

bromine yields bromoacetylbromide-

with ammonia acetamide is produced-

and so on. All these reactions occur at ordinary temperature and nearly always give quantitative yields.

Diketocyclobutane reacts vigorously with water, giving acetoacetic acid-

$$H_2C$$
— CO
 CH_2
 CH_2COOH
 $CO.CH_3$

With bromine γ-bromoacetylbromide is formed-

$$H_2C$$
—CO
 \downarrow \downarrow \downarrow $+Br_2=CH_2Br.CO.CH_2COBr.$

Diketocyclobutane enters into a number of other interesting

reactions. Under suitable conditions keten is polymerised to dehydracetic acid-

This remarkable substance can by very simple means be converted into all kinds of complicated ring compounds of the

benzene, naphthalene, pyrone, isoquinoline and other types.*

This article could not be considered complete without reference to the brilliant researches of J. F. Thorpe and C. K. Ingold, whose work has led to a better understanding of the internal balance of ring structures and has also produced a wealth of new substances. The short survey shows that we have gained access to new classes of substances and reactions which allow us to build up complicated products with the greatest ease and in excellent yields, and that by the application of catalysis almost any of these can be made to undergo manifold transformations of a gradual or sudden nature. This observation will be found to apply, no doubt, to the important metalorganic substances as well.

A new rich field is being opened for the manufacture of medicines, dyes, explosives, tanning, and photographic materials. To what extent the British fine chemical industry will benefit by these discoveries depends on ourselves.

Applications to Physiological Chemistry

In spite of the great amount of good work which has been done in determining the change in properties of a substance due to alterations in character or grouping of constituents, pharmacology is still a purely experimental science. The ease with which the polyketides undergo changes makes us believe that many of them will be very active physiologically. An investigation of the therapeutic properties of these substances should bring about valuable results

Physiology of Taste

In the industry of sweetening agents, too, the same holds good, namely, experiment still scores over theory. From our knowledge of saccharine one would have thought that naphthalene saccharine would also be sweet-the opposite has been found to be the case. All four possible naphthalene saccharines have recently been prepared, and, although they only differ from ordinary saccharine by having a naphthalene ring instead of a benzene ring, are markedly b.tter. Similar, though less remarkable, differences have been observed in the study of dulcin (sucrol, parahydroxyphenylurea), another sweetening agent of commercial importance. Recent experiments have shown that the relative sweetness of a substance is a variable quality depending on the percentage strength of solution. The usually accepted strengths of saccharine and dulcin, namely,

have been found to vary between 200 to 700 in the case of saccharine and from 170 to 350 for dulcin. What is still more have been found to vary between 200 to 700 ms saccharine and from 170 to 350 for dulcin. What is still more extraordinary, it can be shown that in the case of these straordinary is not an additive property. The proportions of these substances can be adjusted in such a manner that the resulting mixture will be about 40 per cent. sweeter than pure saccharine.

Fermentation Processes

The application of micro-organisms for industrial purposes has up to recent years been limited to the manufacture of ethyl alcohol in its various forms, and also to the production of lactic, butyric, and citric acids. Of course, it has long been known that a number of other organic compounds of commercial interest are formed by bacteria and moulds; but it can truly be said that only since the war has this knowledge become a matter of practical value, more especially with regard to the manufacture of glycerin, acetone and butyl alcohol. The range of products of bacterial life is immense. They have such a short life period and are so easily modified by selection

^{*} Trans., 1917, 111, page 762.
† Discovered by Chick and Wilsmore, Trans., 1908, 93, page 946.

and external conditions that their products of metabolism and functions can be varied within very wide limits. If a certain substance is found to be produced, say, by a bacterium, it has been found possible to influence its existence by choice of medium, temperature, and added chemicals in such a manner as to yield increasing quantities of the desired compound. It may be mentioned here that certain yeasts which ordinarily produce alcohol with the barest traces of glycerin can be made by addition of sodium sulphite or carbonate to give a yield of glycerin equivalent to 50 per cent. of sugar in the mash. It is not improbable that micro-organisms will in the future be utilised for the production of dyes and their intermediates.

For the production of maltose and glucose from starch the following method appears to be making headway on the Continent: Sterilised mash is treated with Amylomyces Rouxii or Eurotium Oryzae. A saving of malt and starch compared with the malt process is effected. What part these processes will play in the fine chemical industry will depend entirely on the relative progress made by these and catalytic chemical methods.

Complex Inorganic Compounds

Another field in which the fine chemical industry of the future will make great conquests is the exploitation of the complex inorganic compounds. The remarkable rise of organic chemistry has for a long time captivated almost every chemist of a constructive turn of mind. It is quite certain that inorganic substances present an almost untapped supply for discovery, though, perhaps, not of the same character as that offered by derivatives of carbon. The wealth of cobaltammines which have so far been discovered, and the remarkable cases of isomerism which have been observed in this class of substances, give but a slight indication of what one may expect. Many of these combinations possess beautiful shades of colour. It is surprising that so far the colour industry has only utilised the ferro- and ferricyanides and certain chromates whose structure has not been investigated, while none of the cobaltammines have found application. It is to be expected that many valuable colours will be derived from this source.

Analytical Chemistry

The analytical chemistry of inorganic substances has been developing in such a manner as if no new chemicals have been discovered for the last hundred years. The analysis of the innumerable substances known is still being carried out with the aid of a few acids, bases, and salts; in consequence, analytical chemistry has become a boredom and a terror. In the region of the rare earths still less headway has been made. However, it is quite likely that every element forms a characteristic combination with some inorganic or organic chemical. To produce such substances will be one of the problems of the fine chemical industry. A few such compounds are already known and appreciated—e.g., for nickel dimethylgloxime and α -benzildiozime are used; for cobalt nitroso-R-salt is employed; for the estimation of nitric acid nitron has been found useful, and cupferron for a few other purposes.

What is really of importance in the fine chemical industry? What should British manufacturers aim at? The man who sets out to manufacture some foreign nostrum may succeed in doing some good for himself, but can in no way claim to be doing anything for the development of the resources of his country. The chemical industry ought to satisfy the real needs of our Empire and assist the development of other industries which depend on it. The question now arises, on what lines ought the establishment of the British fine chemical industry to lie? Certainly not in trying simply to reproduce in Britain all those compounds which are manufactured elsewhere. If you try to catch a man in a maze by studiously covering the same ground as he, you have a hopeless task indeed.

In the foregoing columns a few examples have been given of remarkable discoveries made in this country in recent times, and an attempt has been made to show how these could be followed up so as to give thousands of novel fine chemicals with the aid of methods which allow of mass production and cheapness. It must be left to independent enterprise to develop these inventions. The new derivatives will present a subject for fresh researches and in this way an endless chain of progress will be established.

Reviews

- THE MANUFACTURE OF DYES. By John Cannell Cain, D.Sc. London: Macmillan and Co. 1922. Pp. 274. 128. 6d.
- This book is a companion volume to *The Manufacture of Intermediate Products for Dyes*, by the same author. Like the previous work, it makes no serious attempt to explain the chemistry of the reactions involved, but gives the details of the processes employed, usually in the form of an abstract from the patent literature. Dr. Cain has utilised his wide knowledge of the dyestuffs industry in preparing this book, and has selected methods which have been proved to be workable on the large scale. Only one or two isolated examples of laboratory methods can be found.
- The book is divided into 17 chapters, each chapter being devoted to one type of dyestuff. The constitutional formula for each dyestuff is given where possible, and in addition a list of the trade names of this colour (or of others of almost identical constitution) but; unfortunately, there is no index to the initials which are used to denote the names of the various firms manufacturing these products.
- Several chapters, dealing with dyestuffs which have not much practical application, such as nitroso, kitro, and quinoline colours, are confined to a description of the manufacture of one representative of the class. On the other hand, the commercially important colours are dealt with very fully. The chapter on triphemylmethane dyestuffs contains very detailed accounts of the manufacture of several colours, notably malachite green, magenta, and spirit blue, and includes methods for working up byproducts and residues.
- The azo colours are divided into four parts, e.g., monazo, disazo, trisazo, and tetrakisazo; the first two parts are subdivided into: (a) colours containing benzene nuclei only, (b) containing benzene and naphthalene nuclei, (c) containing naphthalene nuclei only. The dyestuffs dealt with in this chapter are important ones, and the details are given without unnecessary elaboration.
- The chapter on anthraquinone colours deals with the hydroxyanthraquinones (alizarin as the most important member of this group is described very fully) and the vat colours made from benzanthrone (indanthrene violets, etc.) and pyranthrone (indanthrene gold, orange, etc.). It is to be regretted that this chapter makes no mention of a number of very important colours made from anthraquinone, for example, the di- and tri-anthrimides and benzoylamino-anthraquinones, or of the group of acid wool colours such as alizarin saphirol, alizarin cyanine green, etc.
- The final chapter on the indigoid dyestuffs consists only of a two-page outline of the manufacture of indigo and thioindigo. The omission of the very important dyestuffs from these chapters leads one to think that the author intended the work to be enlarged considerably before publication.
- An enormous amount of work has been necessary in the compilation of the details, and the large number of references to the original literature which are given increase the value of the book to the technical chemist in this industry.

U.S. Import Duties on Dyes

The Special Deputy Appraiser of the United States Customs Department announces that, in arriving at the American valuation for dyes under the present tar ff law, importers will be permitted to deduct to per cent. from the gross selling price. This represents 8 per cent. for profit and 8 per cent. for expenses, including duty. The Customs Division of the Treasury Department, the Deputy Appraiser states, is expected to approve of this decision just arrived at following conferences with representatives of dye importing interests.

Some Recent Developments in the Chemistry of Alkaloids

By Norman Evers, B.Sc., F.I.C.

The writer reviews the steady progress which has been made within recent years, and points out that nothing in the way of startling discoveries is to be recorded. The remarkable physiological action of the alkaloids as a group remains a mystery, and the relation of chemical constitution to physiological action is still unsolved.

THE period which may or may not be termed "recent" is often a matter of some doubt, but conveniently for the writer's purpose the term is so elastic that it can be made to cover almost any desired period, in which the work carried out can be described within the limits of an article of this kind. the work done on alkaloids during the war years was small; on the other hand the period since the end of the war has been too short to be treated alone. It is therefore proposed in this article to consider the work done on alkaloids since approximately the end of 1912, without confining ourselves definitely to any date if some previous work has to be considered in relation to what follows.

The elucidation of the structure of alkaloids continues steadily. Investigation of some of the lesser known alkaloids has shown some interesting relationships between alkaloids occurring in different species.

Opium Alkaloids.

Morphine.—The problem of the constitution of morphine is a perennial which produces blossoms occasionally in the shape of new structural formulæ, but though each formula has points in its favour it does not appear that it is yet certain which of the numerous suggestions can be definitely adopted as final.

J. v. Braun* and his collaborators have done some interesting work on the action of cyanogen bromide on morphine alkaloids. In the case of morphine and codeine the N:Me group is replaced by CN, but this is not the case with thebaine, which only forms a BrCN addition product. It is therefore concluded from the action of BrCN in analogous cases that in morphine and codeine the C:C bond is not in a β, γ, position to the nitrogen as in Knorr's formula II, but a bridge-union is present as shown in I.

Another suggestion is that the bridge is as in III but the

evidence appears fairly conclusive that the aliphatic double bond of formula II is not present.

The difficulties encountered in the investigation of morphine and codeine due to rearrangement into apomorphine, migration

referred to, and so permit of the application of the usual methods for determining constitution. With this object in view deoxydihydrocodeine, and deoxytetrahydrocodeine were prepared which contain one methoxy group, but the hydroxyl group of codeine has been replaced by hydrogen and the double bond of formula II, or the bridge linkages of I and III have been removed by the addition of hydrogen. Thebaine.—Kleet has isolated from Papaver orientale thebaine and a phenolic alkaloid isomeric with the former, isothebaine C_{17} H_{14} N (OCH₃)₂OH, to which he assigns the constitution IV.

of the hydroxyl group, or the elimination of carbon atoms with the nitrogen atom by exhaustive methylation are all connected with the partially reduced benzene nucleus as represented in II. Mannich and Lowenheim* have sought

a means of so modifying this nucleus by well-defined processes

as to obviate the occurrence of the anomalous behaviour

Papaverine.-Pymant has shown the constitution of pavine (dihydropapaverine) to be as shown in formula V.

Laudanine .--According to Späth, the oxidation of ethyl laudanine gives 3-ethoxy-4-methoxy-benzoic acid which was synthesised from ethyl isovanillate by the action of sodium ethoxide and ethyl iodide forming ethyl ethylisovanillate and saponifying. In the same way the oxidation of the carbethoxy derivative of laudanine gives 3-carbethoxy-4-methoxy benzoic acid which was also synthesised from isovanillic acid. These facts establish the constitution of laudanine to be VI.

Protopine and Cryptopine.—As the result of an exhaustive research on these two alkaloids by Perkin|| with the preparation of a large number of derivatives and decomposition products, the following structures have been assigned to cryptopine VII and protopine VIII.

Chelidoneum Alkaloids.

It has been shown by Gadamer¶ that exidation of the three chelidoneum alkaloids, chelidonine and α and β -homochelidonines indicates that the two former are closely allied, but that \beta-homochelidonine must be placed

Mannich and Lowenheim, Arch. Pharm., 258, 295.

Klee, Arch. Pharm., 252, 211. Pyman, J.C.S., 107, 176. Späth, Monalsh, 41, 297.

^{||} Perkin, J.C.S., 109, 815. || Gadamer, Arch. Pharm., 1919, 257.

^{*} v. Braun, Ber. 47, 2312; Ber. 49, 750, 977 and 2655.

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te he

4-m of

n

OMe

in the protopine group. Formula IX is suggested for chelidonine. In α -homochelidonine one of the methylenechelidonine. In α-homochelidonine one of the dioxy groups is replaced by two methoxy-groups.

On methylation chelidonine gives a laevorotatory methine base of formula X.

Gadamer proposes to re-name β-homochelidonine as allo-yptopine. This alkaloid strongly resembles protopine and cryptopine in its physiological action and also behaves like these bases when oxidised with mercuric acetate. behaviour and the isomerism of cryptopine (VII) and β -homochelidonine indicate that the two alkaloids differ only in regard to the relative positions of the methylene dioxy- and the two methoxy groups. Phosphoryl chloride forms with $\beta\text{-homochelidonine}$ iso- $\beta\text{-homochelidonine}$ chloride which is identical with dihydroberberine methochloride. The difficulty in the formulæ proposed for these alkaloids is that they involve the acceptance of a ten-membered ring, which rarely occurs in nature.

Alkaloids of the Solanaceae

Nor-hyoscyamine has been found by Carr and Reynolds* to accompany hyoscyamine in different species of Solanaceae. It differs from hyoscyamine in having the methyl group attached to the nitrogen atom replaced by hydrogen (XI). The corresponding racemic modification nor-atropine may

be obtained from nor-hyoscyamine. The latter has not been found except accompanied by hyoscyamine.

Scopolamine or hyoscine is an ester of the base scopoline or oscine and tropic acid in the same way as hyoscyamine is an ester of tropine and tropic acid. Although the constitution of tropine has been known for many years, that of scopoline has only recently been elucidated and is still somewhat uncertain. Hess and Suchier† showed that scopoline could be reduced to hydroscopoline, which on oxidation gave scopolinic acid, which proved to be identical with N-methylax1-piperidine-dicarboxylic acid (see also Schmidt‡) showing that scopoline is an alkaloid of the piperidine series. Hess§ was also able to convert hydroscopoline into tropan (XII) which establishes the formula of hydroscopoline as (XIII).

Carr and Reynolds, J.C.S., 101, 946.
 Hess and Suchier, Ber., 48, 2057.

Schmidt, Arch. Pharm., 253, 497.

§ Hess, Ber., 51, 1007.

Further Hess* succeeded in degrading scopoline by Hoff-mann's method and concluded from the evidence that the constitution of scopoline is XIV.

$$\begin{array}{c|ccccc} CH_2 & C & CHOH & CH_2 & CH & CHOH \\ & & & & & & & & \\ CH_2 & NMe & & & & & \\ & & & & & & \\ CH_2 & CH & CH & & CH_2 & CH & CH \\ & & & & & & \\ XIV. & & & & & XY. \end{array}$$

In the meantime, however, King \dagger had resolved scopoline into its optical isomers by means of the d-hydrogen tartrates. Gadamer and Harmer‡ therefore, operating with l-scopoline found that on treating with hydrobromic acid an inactive hydroscopoline bromide hydrobromide is formed, whereas according to formula XIV an optically active compound should be formed. The formation of an inactive compound is only explainable by formula XV. The probable constitution of scopolamine is therefore XVI.

Scopolamine has also been resolved into its optical isomers by King§ by means of its salt with d-bromo-II-camphorsulphonic acid.

Anhalonium Alkaloids.

The work of Spath|| has thrown a considerable amount of light on the constitution of these alkaloids. Not the least interesting point is the identity of anhaline with hordenine, the alkaloid occurring in barley germs. Mezcaline has been prepared by a method which shows it to be -3, 4, 5, -trimethoxy-phenylethylamine. Methyl pellotine is shown by synthesis to have the constitution XVII. Pellotine has

therefore this constitution with the replacement of one methoxy-group by a hydroxyl group, and assuming that the hydroxyl group is in the same position, it is shown that anhalonidine differs only in the replacement of an NMe group by an NH group. Methylanhalamine appears to have the constitution XVIII so that in anhalamine one of the methoxy-groups is replaced by a hydroxyl group. The position of the hydroxyl group in all three alkaloids is, however, still undetermined.

Alkalolds of Peganum Harmala

Probably one of the most interesting pieces of work on alkaloids during the last few years is that of Perkin and Robinson¶ on harmine and harmaline. As a result of a consideration of the derivatives of these alkaloids the formulæ formerly adopted have been discarded. The evidence is strongly

^{*} Hess, Bor., 52B, 1947. † King, J.C.S., 115, 476. † Gadamer and Harmer, Arch. Pharm., 259, 110. § King, ibid,

Späth, *Monatsh*, 40, 129, and 42, 97. Perkin and Robinson, *J.C.S.*, 115, 933.

in favour of formula XIX for harmine, whilst for harmaline - the choice lies between XX and XXI, with a rather greater weight of evidence in favour of XX.

By boiling harmine with excess of hydriodic acid harmol was obtained, which is converted by distillation with zinc dust in hydrogen into harman $C_{12}H_{10}O_2$. It is interesting to note that harman is identical with a base prepared by Hopkins and Cole* by oxidation of tryptophane with ferric chloride. This observation is of great importance in that it gives an indication of the method of formation of an alkaloid in the plant, since it indicates that harmine originates from hydroxytryptophane.

Nor-harman, the parent substance of these alkaloids, has been prepared by Kermack, Perkin, and Robinson† by con-densing tryptophane (XXII) with formaldehyde and oxidising the product with chromic acid.

Harman is therefore norharman with a methyl group in the osition as in formula XIX attached to the carbon next to the nitrogen atom. It is interesting to note that harman has been found by Spath tot be identical with the alkaloid aribine from Ariba rubra and with lotarine§ from Symplocosa race-Also Asahina and Mayeda|| have adopted the formulæ XXIII and XXIV for evodiamine and rutaecarpine, the alkaloids of rutaecarpa, but according to Perkin and Robinson¶ there is just a possibility that the evidence would also be in accordance with these alkaloids also being derivatives of norharman.

Ipecacuanha Alkaloids

It has been established by Carr and Pyman** that the It has been established by Carl and cylindrical and psy-alkaloids of ipecacuanha root emetine, cepheline and psychotrine are related to one another in the following simple way. Cepheline $C_{25}H_{28}(OMe)_3(OH)N_2$ on methylation of the phenolic group is converted into emetine $C_{25}H_{28}(OMe)_4N_2$. Cepheline is a dihydro derivative of psycholyne $C_{25}H_{28}(OMe)_4N_2$. is a dihydro derivative of psychotrine C₂₅H₂₆)N₂. The fact that cepheline can be readily con-(OMe)3(OH)N2. verted into emetine by methylation has some commercial importance, in view of the fact that emetine is the more valuable in medicine. By oxidation of emetine with per-

manganate 6-7 dimethoxyisoquinoline-1-carboxylic acid is formed together with some m-hemipinic acid. Since cepheline does not yield any m-hemipinic acid it is concluded that it is one of the two methoxy groups which are in the o-position to each other that is demethylated in cepheline. Pyman* has shown the presence of two new alkaloids in ipecacuanha, one of them being the O-methyl ether of psychotrine and the other, which he names emetamine, contains four methoxy groups but no N-methyl group and is non-phenolic. It probably has the formula $C_{29}H_{36}O_4N_2$ and differs from emetine in containing two unsaturated linkings.

Strychnos Alkaloids

The previous extensive work of Leuchs and his collaborators has been carried on year by year in a series of papers which up to date number thirty-one. Leuchs and Piercet have shown that dihydrobrucinonic acid contains an alcoholic OH group and that it is stereoisomeric with brucinolic acid. Brucinolone and isobrucinolone are similarly related to each other, since the compounds $C_{19}H_{18}O_7N_8$ prepared by the action of concentrated nitric acid are isomeric, not identical. The isomerism of the brucinolones is probably due to a difference in the positions of a C: C bond such as in XXV and XXVI.

Brucinolic acid gives first a brucinolone (a) which is converted by the further action of alkali for the most part into the (b) form. Strychninolone (a), on the other hand, remains practically unchanged, but ammonia converts both (a) forms into the (b) form.

Lobelia Alkaloids

Four crystalline alkaloids have been isolated by Wielandt from Lobelia inflata, two of which he names lobeline and lobelidine. Formerly the alkaloid "Lobeline" had not been obtained in a crystalline state, and evidently consisted of a mixture of these alkaloids.

Angostura Alkaloids

Troeger and Kroseburg§ find that angostura bark contains only the alkaloids cusparine, galipine and galipidine. From the fact that galipine on oxidation with permanganate yields veratric acid and methoxyquinoline carboxylic acid, the authors suggest the formula XXVII.

Troeger and Beck|| state that the formula previously adopted for cusparine $C_{20}H_{19}O_3N$ is untenable, and return to an earlier formula $C_{19}H_{17}O_3N$ suggested by Koerner and Boehringer. No evidence of the presence of a hydroxyl group or ketone group in cusparine could be adduced.

Conlum Alkaloids.

Hess and Weltzien¶ have shown that the synthetic "soconiine" obtained by Ladenburg** which differed from natural conline only in having a slightly higher rotation, was eally impure d-coniine.

^{*} Hopkins and Cole, J. Physiolog., 29, 451,
† Kermack, Perkin and Robinson, J.C.S., 119, 1602.
‡ Spāth, Monatsh., 1919, 40, 351.
§ Spāth, Monatsh., 1920, 41, 297.

§ J. Pharm. Soc., 1920, 41, 297.
¶ Perkin and Robinson, J.C.S., 115, 933.
** Carr and Pyman, J.C.S., 105, 1591.

^{*} Pyman, J.C.S., 111, 419,
† Leuchs and Pierce, Ber., 45, 3412.
‡ Wieland, Ber., 54B, 1784.
§ Troeger and Kroseburg, Arch. Pharm., 250, 494.

| Troeger and Beck, Arch. Pharm., 251, 246.

[¶] Hess and Weltzien, Ber., 53B, 139. ** Ladenburg, Ber., 26, 854.

Jaborandi Alkaloids.

A new alkaloid has been discovered in Pilocarpus microphyllus by Leger and Roques* and by Pyman† which the former name carpiline and the latter pilosine. Pyman gives its constitution as XXVIII, and its relation to pilocarpine XXIX is seen from the formulæ.

Ph. CHOH. CH—CH. CH₂. C. NMe C₂H₃. CH—CH. CH₂. C. NMe CH₂ CH. N CH
$$\begin{array}{c|ccccc} C_{1} & C_{1} & C_{2} & C_{3} & C_{4} & C_{5} & C_{5} & C_{6} & C_{6$$

Cinchona Alkaloids.

Large numbers of derivatives of cinchona alkaloids have been prepared by various authors, notably by Jacobs and Heidelberger, but this work cannot be adequately described here

Rabet has suggested the name ruban for the mother substance of the cinchona alkaloids (XXX). Quinine is therefore 6'-methoxy-3-vinyl-9-rubanol.

Cytisus Alkaloids.

Cytisine. - Spaths shows that the cytisoline obtained by the action of hydriodic acid and red phosphorus on cytisine is 2.hydroxy-6: 8-dimethylquinoline. Other considerations indicate that formula XXXI is a possible one for cytisine.

The similarity of this structure to that of leucine XXXII suggests that this amino-acid which frequently occurs free in the Papilionaceae may be the parent substance of cytisine. Cytisoline has been synthesised by Spath from 6-8 dimethylquinoline.

Alkaloids of Ephedra Vulgaris

Ephedrine and Pseudoephedrine have been synthesised by Spath and Göhring||, starting with propylaldehyde, converting this by bromine into 1, 2-dibromo-1-methoxy-propane, thence by Grignard to I-phenyl-I-methoxy-2 bromopropane. The bromine atom is then replaced by =NMe and on heating with HBr dl-pseudoephedrine Ph.CH(OH).CHMe.NHMe, results. This was resolved into its isomers by means of the tartrates. The d-pseudoephedrine obtained, is identical with the natural product, and may be transformed into *l*-ephedrine in the same way. Other syntheses have been carried out by Eberhardt.¶

Berberine.

An extensive study of numerous derivatives of dihydroberberine has been made by Freund and his collaborators.** Perkin, †† in view of the close relationship of berberine to cryptopine, has studied a number of closely allied derivatives of the two alkaloids. This relationship will be seen by comparing formula XXXIII berberine with that of cryptopine VII.

Other alkaloids whose constitutions have been cleared up are hygrine, Hess,* galegine, Tanret,† sinapine, Späth,‡ isochondodendrine, Faltis and Neumann.§

New Alkaloids.—The number of new alkaloids discovered

is almost balanced by the number which have been found to be identical with some other alkaloid or to be an impure form of another alkaloid. The following list shows some of those recently discovered which have not yet been mentioned.

Source.	Name.	Formula.	Author.
Delphinium ajacis	Ajacine	CasHanNO4H	
Delphinium ajacis	Ajaconine	C17H19NO2(?)	
Daphnandra micrantha	Daphnoline	CHON	Voelker, Pyman. C.
Daphnandra micrantha Daphnandra micrantha	Daphnandrine Micranthine	C36H38O8N2	Pyman. Pyman.
Ormosia darycarpa	Ormosine	CauHaaNa	Hess and Merck.**
Ormosia darycarpa	Ormosinine	-	Hess and Merck.
Mitragyne speciosa	Mitragynine	C.H.O.N	Field. ††
Mitragyne diversifolia	Mitraversine	C.H.O.N.(Field

II. The Natural Occurrence of Alkaloids

Little progress has been made in the important problem of the function of alkaloids in the plant; in fact, we are still almost completely in the dark on this point. In certain cases already mentioned their origin from amino-acids is becoming clearer. Annett; has investigated the role of morphine in the life of the opium poppy. He concludes that morphine is a useless end-product of metabolism. The plant having no mechanism for excreting an end-product of such complicated structure stores it in places where it can do no harm to its own metabolism—i.e., chiefly in the capsule. The lactiferous system would appear to be a means of removing waste products of metabolism. It was found that manuring with nitrogenous manures largely increases the yield of latex, but the percentage of morphine in the latex is not largely modified, Similarly, climate and weather conditions do not affect the

morphine content, but only the yield of latex.

The question of the ability of plants to synthesise optical antipodes is discussed by Hess and Weltzien (Ber: 53B, 119). The isolation of inactive forms of alkaloids containing at least one asymmetric carbon atom from plant materials has been effected in a number of cases. The presence of the inactive form may be due to (1) racemisation by the extraction medium during the working up of the plant material; (2) racemisation of primary active forms within the plant during its life activity, or (3) "symmetrical" processes during the synthesis of the alkaloid, participated in by "symmetrical" enzymes, or affected wholly or in part without the aid of enzymes. In the case of easily racemised alkaloids such as atropine, probably (1) is the correct explanation, but this cannot be the case where (I) is the correct explanation, but this cannot be the case where the conditions of extraction are such that the racemisation of the artificially prepared active forms does not occur under the same conditions such as is the case with the pelletierine Hess and Weltzien found that d-conline and alkaloids.

^{*} Leger and Roques, Compt. rend., 155, 1088. † Pyman, J.C.S., 101, 2260.

Tyman, J.C.S., 101, 2200.

Rabe, Ber., 55B, 522.

Spath, Monatsh., 40, 15 and 93.

Spath and Göhring, Monatsh., 41, 319.

Eberhardt, Arch. Pharm., 258, 97.

Freund, etc., Ann., 397, 30.

Perkin, J.C.S., 113, 722.

^{*} Hess, Ber., 46, 4104.
† Tanret, Compt. Rend., 158, 1426.
‡ Spåt
§ Faltis and Neumann, Monatsh., 42, 311.
|| Keller & Voelker, Arch. Pharm., 251, 207.
|| Pyman, J.C.S., 105, 1679.
* Hess and Merck, Ber., 52B, 1976.
†† Field, J.C.S., 119, 387.
‡ Annett, Biochem. J., 14, 618. ‡ Spath, Monatsh., 41, 271.

d-methylconiine cannot be racemised by heating with alkalies or by heating for several days with concentrated hydrochloric acid at 200°, so that the possibility of racemisation during the working up of the material or within the plant is rendered very improbable, but there remains the possibility of the formation of an intermediate unsaturated derivative without an asymmetric carbon atom as in the formation of inactive lactic acid from glucose where methylglyoxal is the intermediate product. The same principles apply to laudanosine and scopoline, but in view of the asymmetric structure of the latter it seems hardly probable that the existence of the inactive form in the plant can be explained in the same way as the formation of inactive lactic acid. The authors, therefore, conclude that unlike the animal organism the plant organism can effect "symmetrical" syntheses in which "symmetrical" enzymes take part.

III. Analytical Methods

The literature in this section consists largely in improvements in existing methods. An interesting exception is the use of silicotungstic acid for the precipitation of certain alkaloids by Taigner.* Atropine, strychnine, and cocaine are completely precipitated by this reagent, and the precipitate may be dried and weighed. The indentification of alkaloids by microchemical methods has been much extended, and many very sensitive and characteristic tests have been worked out. A warning should be given, however, against placing too great reliance on these tests, as small quantities of im-

purities are apt to upset the results; the concentration of the solution is another matter of importance. For the extraction of alkaloids from plant products Rapp* makes use of the following method: the alkaloids are precipitated from the acid solution by the addition of alkali, and the extraction with chloroform is then facilitated by the addition of plaster of Paris until a thick mud is formed. This prevents emulsification, and the separation is very much quicker and sharper.
Lizius and Eve.st have shown the value of the newer indi-

caters for the titration of alkalo. ds and g ve a l st cf a number of alkaloids with the correct indicator for the t tat on of each.

A general review of the work detailed in this article shows steady progress in many directions without anything remarkable in the way of new discoveries. No new alkaloids have been discovered of any particular value in medicine, either in nature or by synthesis. The remarkable physiological action of the alkaloids as a group remains a mystery, and the relation of chemical constitution to physiological action is still in darkness. Only in a very few cases have alkaloidal derivatives prepared in the laboratory been found to have a superior value in medicine to the natural alkaloids—in fact, the tendency in medicine has of late years been to "return to nature." and to the use of the natural drug rather than of the alkaloids themselves. While in other fields the chemist can point to synthetic triumphs of the utmost value in the cure of disease, up to the present it must be acknowledged that in this matter of alkaloids Nature still holds first place.

The Use of Wood Distillation Products in the Dye Industry

By H. M. Bunbury, M.Sc., A.I.C.

The writer deals with a phase of the dye industry which has received comparatively little attention in the Technical Press. It may certainly be said that progress in the manufacture of synthetic dyes would not have been so remarkable had it not been for the large quantities of acetic acid and methyl alcohol produced by wood distillers. Again, the latter industry undoubtedly owes a good deal to the dye manufacturers for the manner in which they have stimulated the demand for wood distillation products.

AT a first glance the connection between the synthetic dye and wood distillation industries is, perhaps, not very apparent. The former sprang into being about the middle of the last century, and developed in a most remarkable manner during the succeeding half-century. Although wood had been dis-tilled in more or less crude forms of apparatus varying from the charcoal pit to the Reichenbach and similar ovens, the rise and development of the wood distillation industry as we know it to-day synchronised with that of the dye industry. This was not a mere coincidence. Previously wood had been distilled chiefly for the production of charcoal for iron smelting and fuel purposes. It was not until about the time that the dye industry began to make its demands that the value of some of the other products came to be realised. The everincreasing call for supplies of pure methyl alcohol and acetic acid was in no small measure responsible for the development of wood distillation as a scientific industry, especially those parts of the process dealing with the refining of the crude products.

Very large quantities of methyl alcohol and acetic acid and their derivatives are employed to-day, both in the manufacture of dyestuffs and in the textile dyeing and printing industry —practically all of the two primary products are supplied from wood distillation and some of the derived products are made by the dyestuff manufacturers themselves. It is a far cry from the methoxy groups in the condensed coniferyl alcohol complexes of lignin to the methyl groups in, say, Crystal Violet or Diamine Sky Blue. How many of us when admiring a Liberty silk realise, or even think, that one of the constituent parts of the dye might quite conceivably have been taking its place a short time before—perhaps a matter of days—in the structure of a beech or maple tree? The application of acetic acid and methyl alcohol and their derivatives in the dye and dyeing industries is extremely wide and varied, and it is possible to give only a few examples in illustration of their importance and indispensability.

Acetic Acid and Acetic Anhydride Apart from its general use as a solvent and medium in which various reactions such as reductions and oxidations are carried out, acetic acid finds one of its chief applications in the acetylation of amino groups; both the glacial acid and its anhydride are used for this purpose. The acetyl group figures in the final dyestuff only in a few cases such as, for example, Amidonaphthol Red 6B and Chromotrope 6B, which are derivatives of p-aminoacetanilide. The acetylation is usually carried out for the purpose of protecting the amino group from the attack of reagents which are employed in subsequent operations, for example, nitrations and chlorina-Some very important intermediates have to be treated in this way. As an instance we may take p-nitroacetanilide, which is obtained by the nitration of acetanilide, and which yields p-nitraniline and p-phenylenediamine. The former is an intermediate for Para Red, Autol Red BL, Naphthol Blue Black, Diamine Green G, etc., and the latter is used for the production of important azo blacks, such as the Coomassie wool blacks, Columbia black, Dianol black, etc. The methyl homologue of p-nitraniline, m-nitro, p-toluidine, is the intermediate for the valuable red pigments Helio Fast Red and Lithol Fast Scarlet. Other amines, for example, benzidine and tolidine, are acetylated before forming their nitroderivatives, which are intermediates for Anthracene Red and Salicine Red. Again, a-acetylaminoanthraquinone is the starting point for the valuable vat dye Algol Red 5G. Acriflavine is of especial interest, as not only is acetic anhydride and sodium acetate used in its preparation, but so also are formaldehyde and dimethyl sulphate-all of them secondary products from wood distillation. Acriflavine is not used as a dyestuff, and is mainly interesting on account of the prominence which it has attained in recent years by reason of its antiseptic and other medicinal properties.

Chloracetic Acid

Although its application is restricted, chloracetic acid has nevertheless proved of great value to the dye industry. For many years it has been employed for the production of phenylglycine, from which indigo is made, and it is interesting to note that although other methods for the production of indigo have been introduced in which chloracetic acid is not used, one of the best of these involves the use of another derived wood distillation product, viz., formaldehyde. Chloracetic acid is employed in the preparation of the thioindoxyls which are the intermediates for a number of valuable vat dyes, such as Ciba Grey G, Ciba Violet B, Ciba Scarlet G, Helindone Brown G and Helindone Pink BN.

Acetoacetic Ester and Oxalacetic Ester

These derivatives of acetic acid are employed in the production of the pyrazolone dyestuffs. When acetoacetic ester is condensed with phenylhydrazine, I-phenyl, 3-methylpyrazolone is produced. When this is treated with diazotised I-amino 2-naphthol 4-sulphonic acid, Eriochrome Red B is obtained. From the monosulphonic acid of the same pyrazolone is obtained Fast Light Yellow G, and the dichlor derivative of this is the well-known Xylene Yellow. Other dyestuffs of this group are the Dianii Yellows and Polar Yellow. Oxalacetic ester is used in a similar manner for the production of Flavazine S, and one of the methods for obtaining the famous Tartrazine also involves the use of this compound.

Acetone

Up to the present acetone has found little application in the manufacture of dyestuffs. It is used for the preparation of indigo salt, which is produced by condensing o-nitrobenzaldehyde with acetone and forming the bisulphite compound of the resulting phenyllactomethylketone. Indigo salt is used for printing, the indigo being developed on the fibre. Other acetone compounds of this type are also prepared—e.g., the acetone compound of 2-nitro 5-acetylamino-benzaldehyde, from which Helindone Grey BB is obtained.

The Metallic Acetates

With the exception of sodium acetate, the metallic acetates are not used in the production of dyestuffs. They are, however, together with acetic acid itself, extensively employed in the dyeing industry. Acetic acid is used for acidifying the dye bath in a large number of dyeing operations; the "commercial" acid with a strength of about 29 per cent. is generally employed for this purpose. Ammonium acetate—which is conveniently classed here with the metallic acetates—is used in the dyeing of wool with acid and direct cotton colours and It is also employed in the stripping of colours from wool and silk. The aluminium acetates and sulphate-acetates constitute important mordants. They are prepared by the interaction of calcium acetate (commercial acetate of lime) and aluminium sulphate. The resulting solution of basic acetates and sulphate-acetates is known as *red liquor*. The principal use of the aluminium mordants is in calico printing and in the dyeing of alizarin reds on cotton and wool. Chromium acetate is an important mordant for printing on cotton and wool; the sulphate-, chloride- and nitrate-acetates are also employed in calico printing. Ferrous acetate is one of the most important mordants. It is known as *pyrolignite of iron, iron liquor* or *black liquor*. It is obtained from crude pyroligneous acid. The destructive distillation of the softwoods (conifers) produces a pyroligneous acid which is only about half as rich in acetic acid as is the liquor from hardwoods. In some cases it has not been a commercial proposition to work up softwood pyroligneous acid for the production of acetate of lime and wood alcohol, and one of the uses to which the crude liquor has been put is the production of iron liquor for mordanting. Since it is ferrous acetate and not the ferric salt that is required, the crude pyroligneous acid is very suitable, as it contains reducing substances such as aldehydes, catechol, etc., which retard the oxidation of the ferrous acetate. *Iron liquor* is used as a mordant in cotton dyeing, calico printing and the production of blacks on silk. Stannous acetate is used to some extent in calico printing, and basic lead acetate is sometimes used for weighting silk

Methyl Alcohol and its Derivatives

Methyl alcohol finds its chief application in the dyestuffs industry as a methylating agent. Dimethyl sulphate is also largely used for the same purpose. The demand for pure methyl alcohol grew rapidly from about the time of the application of dimethylaniline—produced technically by Bardy in 1866—in the preparation of dyestuffs: Methyl Violet was produced in 1866, Methyl Green in 1871, and Malachite Green in 1878. Some years after the development of these and similar dyes came the application of formaldehyde in the production of dyestuffs, and this gave a further impetus to the production of methyl alcohol. The development of the refining plants and processes necessitated by these rapidly growing demands forms an interesting chapter in the history of the wood distillation industry. Some of the plants have reached such a state of perfection to-day that 99.9 per cent.

methyl alcohol may be obtained from the neutralised liquor (distilled pyroligneous acid after neutralisation with lime) in one operation.

Methyl Alcohol

One of the most important intermediates used in the dyestuff industry is dimethylaniline. It is represented in almost every one of the main classes of dyestuffs, the anthraquinone and indigo vat dyes forming the most important exception. It is prepared from aniline and pure methyl alcohol. Among the azo dyes it enters into the composition of Orange III., Azo Green, Butter Yellow, etc. In the triphenyl methane group it is employed in the production of New Solid Green 2B, Fast Green extra, Crystal Violet, Victoria Blue, Chrome Violet, Green, and Blue, etc. In the diphenylamine group it enters into the composition of indophenols, thiazines, oxazines and azines. Among these we may mention Methylene Blue, Meldola's Blue, Neutral Violet, Safranine MN, Thionine Blue G. Gallocyanine, Muscarine, Rhoduline Violet, Naphthazine Blue, etc. Auramine is also a derivative of dimethylaniline. Monomethylaniline is not so extensively used as the dimethyl compound, but finds application in the preparation of triphenylmethane colours and for the producof benzylmethylaniline, from which Light Green SF bluish and Acid Violet 4BN are derived. Methyl o-toluidine is used in the preparation of Glacier Blue and Brilliant Rhoduline Red B. Dimethyl p-phenylenediamine is the Rhoduline Red B. Dimethyl p-phenylenediamine is the intermediate for the sulphur dye Immedial Pure Blue. Methy lated phenols are not largely used, but there are two very important intermediates containing the methoxy group, viz., o-anisidine and dianisidine. These compounds are derived from o-nitroanisole, which may be obtained by the methylation of o-nitrophenol; o-anisidine is employed in the manufacture of Chrome Fast Yellow GG, Pigment Purple A and Azocochineal; dianisidine is the intermediate for Benzo-purpurin 10B, Benzoazurine G, Diamine Sky B'ue, Chicago Blue 6B (Dianol Brilliant Blue 6B), and Benzo Fast Blue B

Formaldehyde

Formaldehyde is produced during the destructive distillation of wood, but so far no attempt has been made to isolate it from the other products. The extremely small amount which is present—a fraction of one per cent. of the weight of the wood distilled—and the presence of other compounds, such as aldehydes and phenols, with which it readily reacts, would probably render abortive any attempts to produce it commercially in this way. It is manufactured by the catalytic oxidation of methyl alcohol, which must be very pure and free from acetone. Since its first application as a synthetic agent in dyestuffs manufacture in 1889 its use has gradually extended until to-day it is a reagent of prime importance, not only in the manufacture of dyestuffs, but also in their application to the fibre. One of its chief uses is in the synthesis of colours of the triphenylmethane group. The important intermediate, tetramethyldiaminodiphenylmethane, is formed by the condensation of formaldehyde and dimethylaniline, and from it are derived a large number of valuable dyestuffs. Some of these have already been given as derivatives of dimethylaniline, and in addition we may mention Turquoise Blue, Chrome Bordeaux, Naphthalene Green V, and Wool Green BS. Acridine Yellow and Acridine Orange are obtained by condensation of formaldehyde with metadiamines.

An interesting application of formaldehyde is that in which it is used for the after-treatment of certain dyestuffs on the fibre in order to render them fast to washing and milling. Some twenty-odd years ago the firm Geigy used formaldehyde for the after treatment of Diphenyl Black, and since that time a large number of dyestuffs have been brought out which are specially suited to this treatment. Among these we may mention the Formal dyes of Geigy, Plutoform dyes of Bayer, Naphthoform colours of Kalle, Diamine aldehyde dyes of Cassella and the Vulcan colours of Levinstein. The last named, for example, Vulcan Black GS, are recommended for printing and hexamethylenetetramine (from commercial formaldehyde and ammonia) is employed. It has been found that azo colours which contain resorcinol, m-aminophenol, m-phenylenediamine (or their derivatives) as end component, combine with formaldehyde to yield products which are insoluble and

(Continued on page 606).

The Chemistry of Synthetic Drugs

By J. B. Cohen, Ph.D., B.Sc., F.R.S.

(Professor of Organic Chemistry in the University of Leeds).

In an article of unusual interest Professor Cohen presents a picture of the many directions in which organic chemistry is being employed in the services of medicine. It is shown too, that in spite of the large number of compounds which has found an application in medicine we are still profoundly ignorant of the relation which subsists between the structure of these substances and their action on the body.

The study of pharmacology has relation to the physiological effects of certain chemical substances, the majority of which find a place among organic compounds. The preparation of synthetic drugs had its origin first in the isolation of the active principles of certain medicinal plants, and secondly in the study of their structure. The isolation of cocaine from coca leaves not only established the nature of the active principle, but the knowledge of its structure led to the synthesis of a variety of even more valuable substances having similar properties.

In this way it was shown that a certain relation exists between structure and physiological properties. The relation is, however, by no means well defined owing partly to the complexity of the organism with which they are brought into contact and partly to the physical as well as the chemical nature of the substances themselves. Solubility in water or in the animal fluids and consequent rate of absorption, as well as volatility, are factors of importance. Moreover, the drug may, in addition to its specific function, set up some secondary effect by acting on certain tissues in its passage through the system. A small dose may produce one result, whilst a large dose by its indirect action may bring about a different and in some cases an exactly opposite effect.

Occasionally it is possible to guard against this indirect action. For example, the gastric juice of the stomach, containing a minute quantity of hydrochloric acid, cannot hydrolyse esters, which the alkaline secretion of the intestine is capable of effecting. In this way salicylic acid, which has an irritant action on the stomach, may be rendered innocuous by conversion into its phenyl ester (salol) which is only hydrolysed on reaching the intestine, where the free acid is able to perform its specific function. It is an interesting fact that among optically active compounds the two active forms may exert very different effects. This has been observed in the case of d and l-nicotine, the laevo, i.e., the naturally occurring compound of tobacco, being the more toxic; also in that of the two adrenalines, the laevo compound again being physiologically the more potent. Such knowledge can only be obtained by experiment, and it is by a careful comparison of the action of a series of similarly constituted compounds on the living organism that these highly complex problems can be attacked. In spite of the difficulties which have naturally attended this

In spite of the difficulties which have naturally attended this branch of investigation, prcgress has been continuous and the number of valuable synthetic drugs has steadily increased. An attempt has been made by Ehrlich and others to discover a theory underlying their action. According to Ehrlich, certain groups in the molecule possess the power of attaching or anchoring themselves to the cells upon which they act, after the manner of certain dyestuffs which attach themselves to particular fibres. These anchoring groups enable the drug to exert its specific action. If this anchoring group is removed or modified, a second anchoring group may come into action and attach itself to some other tissue with entirely different results. An acid group (CO.OH or SO₂H) may suspend the activity of an anchoring group until esterification renders it inactive. Benzoyl ecgonine only exerts its action as a local anæsthetic when the adjoining carboxyl group is esterified. Whatever may be the cause, it is remarkable how slight a change in structure will completely alter the physiological effect; whilst on the other hand substances of a totally different constitution may possess almost identical physiological properties.

Anæsthetics and Hypnotics

Narcotics, which include anæsthetics and hypnotics, act upon the nerve centres, inducing sleep, or in larger doses insensibility. The aliphatic hydrocarbons, and to a greater

degree the unsaturated hydrocarbons of the ethylene, acetylene and benzene series, have a narcotic action which increases with their volatility and solubility in water, so that the higher, less volatile and less soluble members are inert. Many of the aliphatic alcohols, such as tertiary amyl alcohol (CH_3)₂ $C_2H_5C.OH$, have a narcotic action. This power is preserved to a certain degree in the aldehydes. Paraldehyde is a useful hypnotic, being less irritant than acetaldehyde. Many of the more volatile halogen derivatives of the paraffins have an anæsthetic action due to the presence of the halogen. The activity of the chlorine derivatives of methane increases with each additional chlorine atom from methyl chloride to carbon tetrachloride. Chloroform is well known as a valuable anæsthetic. Its admixture with ethyl chloride and bromide is known as somnoform. Both ethylene and acetylene dichloride have useful anæsthetic properties. Chloral hydrate is an important hypnotic and many of its derivatives such as chloralamide and dormiol are also employed.

 ${\rm CCl_3CH}({\rm OH}).$ or ${\rm H.CHO}$ ${\rm CCl_3CH}({\rm OH}){\rm O}$ C $_5{\rm H}$ $_{11}$ Chloralamide. Dormiol.

Other hypnotics are *butyl chloral*, obtained by passing chlorine into acetaldehyde, chloretone and brometone, the latter being condensation products of acetone and chloroform or bromoform.

CH₃.CHCl.CCl₂CH(OH)₂ CCl₃.C(OH)(CH₃)₂

Butyl chloral. Chloretone.

The last two are often used as a specific against sea-sickness. Sulphonal is prepared by condensing acetone with ethyl mercaptan $C_2H_5\mathrm{SH}$, and then oxidising the product with permanganate. Trional and tetronal, which possess a similar but somewhat greater activity, are made respectively from ethyl, methyl and diethyl ketones.

CH₃ C SO₂C₂H₅ CH₃ C SO₂C₂H₅ C₂H₅ C SO₂C₂H₆ C₂H₅ C SO₂C₂H₈ C₂H₅ C SO₂C₂H₈ SO₂C₂H₈ SO₂C₂H₈ Trional. Tetronal.

Of the methane group of hypnotics the most important are urethane and its derivatives, hedonal, adalin, neuronal and bromural.

NH₂

NH₃

CO.OC₂H₅

Urethane.

NH₂

CO.O CH(CH₂)(C₂H₇)

Hedonal.

Other derivatives, such as diethylacetyl- and ethylpropyiurethane, are said to be more effective than urethane.

NH.CO.CH(C_2H_5)₃ NH.COCH(C_2H_3)(C_3H_7) COO C_2H_5 COO C_2H_5

Adalin is diethyl bromacetyl urea, (C₂H₅)₂CBr CO NH CO NH₂

and is less toxic than veronal (see below). Hypnotics belonging to the same group are neuronal (diethyl bromacetamide), bromural (and bromesoraleryl urea).

CH₃Br (CH₃)₂ CH.CH Br
CO.N(C₂H₅)₂ CO.NH.CO.NH₂
Neuronal. Bromural.

Veronal, also known as barbitone, malourea, malonal, hypnogen and its sodium derivative (medinal), is one of the most valuable hypnotics, but has the undesirable effect of

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inducing the drug habit. *Proponal* and *luminal* belong to the same group and have similar properties:

$$(C_2H_6)_2C$$
 $(C_3H_7)_2C$
 $(C_3H_7)_2C$

Luminal.

There are various methods by which they are prepared, the raw materials being either the alkyl derivatives of malonic or cyanacetic ester on the one hand and either urea, guanidine or dicyandiamide on the other.

Local Anæsthetics

Among the local anæsthetics cocaine the alkaloidal constituent of the leaves of Erythroxylon coca has long been known as a powerful but not a very safe drug owing to its toxic character. But a knowledge of its structure has led to many successful attempts to produce synthetic drugs of similar constitution. Before discussing these, it may be pointed out that the removal of the methyl carboxyl group, as in tropa-cocaine, which is also a constituent of the coca leaf, produces a more powerful and less toxic substance than cocaine, whereas the attachment of both ester groups to the same carbon atom as in α -cocaine inhibits entirely the anæsthetic action. Again the acid radical is apparently capricious in its effect, for the maminobenzoyl, phthaloyl, cinnamyl and isotropyl derivatives are inert substances.

Among the synthetic drugs having similar properties may be mentioned α -and β -eucaine, stovaine, alypine, novocaine, holocaine, orthoform, nirvanine, anaesthesin, propaesin and acoine, which possess the following formulæ:

New Orthoform. Nirvanine.

CH₃O.OC

CO.OCH₃

Orthoform.

CO.OCH₃

OH

It will be seen from the above that the only essential part of the structure producing local anæsthesia is the ester of an amino acid of either of the following general framework:

RRN.C.C.O COR or RRN.C.C.C.O COR,

in which the acid radical (COR) may be aliphatic or aromatic. J. von Braun has made the interesting observation that by replacing the methyl group of the central nitrogen atom in anhydroecgonine by a propyl benzoate chain such as that in tropacocaine, the anæsthetic properties are not only increased but the intense toxicity of cocaine is removed. The substance has been named eccaine.

Antipyretics

One of the earliest attempts at the synthesis of an antipyretic compound followed the discovery that quinine contained a methoxyquinoline nucleus. From the fact that tetrahydroquinoline is physiologically more active than quinoline, O. Fischer and Filehne were led to prepare *kairine* and *thalline* by Skraup's reaction. They proved, however, unserviceable owing to their toxic properties and were soon replaced by *antipyrine* (or r phenyl 3 methyl 5 pyrazolone).

It was discovered by Knorr in 1883, who prepared it by condensing acetoacetic ester with phenylhydrazine and methylating the product. A similar compound is *pyramidons*, which is the dimethylamino derivative and according to Filehne is three times as powerful as the former and its action lasts longer. But there are a great variety of substances, mostly derived from the aromatic series, which possess antipyretic and antineuralgic properties. Acetanilide, under the name of *antifebrin*, though a somewhat unsafe drug, forms a constituent of cheap headache powders. *Exalgine* is its methyl derivative and is likewise not a safe remedy. Much more effective are the derivatives of *p*-amino phenol. Attention was directed to this substance by the fact that it is formed from aniline in its passage through the body. The acetylation of the amino group lowers the toxicity, which is further reduced by methylating or ethylating the hydroxyl group.

They can be produced in various ways by well-known methods, which need not be described in the present article In addition to these a variety of other synthetic drugs claim to possess similar physiological properties, of which some of the formulæ are here given:

Antiseptics

The term antiseptic implies the power of inhibiting the growth of germs without necessarily destroying them. Such a substance is boric acid. But the word is now applied indifferently to substances which inhibit and kill and is synonymous with disinfectant and germicide. Antiseptics may be divided into four classes: the halogen compounds, the antiseptic action of which depends on the presence of free or combined halogen, the phenol antiseptics, the antiseptic dyestuffs, and a few which fall into none of these groups. The halogens have long been recognised as possessing a powerful antiseptic action. Iodine itself, and such substances as the hypochlorites which readily attack protein matter, are among the most active germicides. Iodoform is extensively used in surgery, but its unpleasant and penetrating odour has led to the introduction of various substitutes, such as iodoformin, a compound with hexamine which is odourless, so also is iodol or tetraiodopyrrole, both of which act by liberation of iodine. Tri-iodo m. cresol (losophan) and the iodexy compounds known as aristol (thymol di-iodide) and europhen have antiseptic properties.

Soziodol $C_6H_2I_2(OH)SO_3K$, isoform (iodoxyanisol) $C_6H_4OCH_3.IO_3$ and iodoguaiacol may also be included. The chloramines form another group of organic compounds containing chlorine. Chloramine T. and dichloramine T. are obtained from p-toluene sulphonamide by the action of sodium hypochlorite.

The former is a neutral, crystalline substance which is soluble in water and acts by liberating hypochlorous acid; the second compound is insoluble in water and though slowly decomposed by water can be used in a solution of chlorinated paraffin or eucalyptol. *Halazone* is the dichloramine of sulphobenzoic acid and is used for sterilizing water.

By the replacement of hydrogen in aromatic hydrocarbons by hydroxyl, phenols are produced having in different degrees antiseptic properties. The property is intensified by increasing the number of hydroxyl groups and also by introducing halogen atoms; but is accompanied by increased toxicity. Methyl groups, whilst increasing the antiseptic effect, render them less poisonous. On the other hand, their solubility is diminished. Such substances as cresol $C_0H_4(CH_3)OH$ have, therefore, to be used as soap emulsions (lysol) or dissolved in a suitable solvent. β . Naphthol is also used as the sodium salt under the name of microcidin. Whilst these substances are useless for internal application, the entrance of a carboxyl or methoxyl group into the ortho position (the meta and para positions are ineffective), though it diminishes the antiseptic action, lowers the toxicity, and both salicylic acid and its sodium salt and guaiacol are useful internal antiseptics.

Salicylic acid, it may be added, acts also as an antiseptic and anti-rheumatic. It often, however, disturbs the digestion and has consequently been replaced by aspirin, the acetyl derivative which is only hydrolysed on reaching the intestine. Other specifics found beneficial in the case of rheumatism are

atophan (phenylquinoline carboxylic acid) and hexophan (salicylquinoline carboxylic acid).

A group of antiseptics known as the salols consist of salicylic acid in which the carboxyl hydrogen is replaced by phenolic and other radicals. There are a large number of these compounds enjoying a variety of trade names. Among them may be mentioned salol (phenol salicylate), betol (β. naphthyl salicylate), methyl salicylate or wintergreen oil, the monoglyceric ester (glycosal), the glycol ester (spirosal), the acetone ester (salacetol), guaiacol carbonate (duotal), the benzoyl ester of methyl salicylate (benzosalin), the acetyl ester of methyl salicylate (methylaspirin), the methyl ester of dibromo salicylic acid (salibromine), etc.

Antiseptic Dyestuffs

Certain dyestuffs have been shown to possess not only a destructive action on blood parasites of protozoal origin such as trypan red and trypan blue, but, like malachite green, brilliant green and crystal violet, act as true antiseptics in their power of destroying micro-organisms. Among the latter class certain acridine dyestuffs have recently come into prominence, namely, diamino acridine sulphate (proflavine) and its metho chloride (acriflavine).

Rivanol, a new acridine antiseptic, has been described by

Morgenroth

Among the other antiseptics not included in the above categories are formaldehyde and its polymeric derivative paraform which on heating vaporises, acting like formaldehyde as a powerful disinfecting agent, as well as compounds of formaldehyde with gelatine (glutol), with dextrin (dextroform) and lactose (formamint). Hexamine or uvotropine, which is the crystalline compound formed by the union of formaldehyde with ammonia, is employed as a urinary antiseptic. Many salts and addition products of hexamine have been introduced under trade names such as the camphorate (amphotropen), the ethyl bromide (bromalin), the compound with sodium acetate (cystopurin), the resorcinol compound (hetraline), the guaiacol compound (hexamecol), etc. Tannic and gallic acids are antiseptics. The unpleasant taste of tannic acid is masked in the acetyl derivative tannigen and by its union with formaldehyde, tannoform. Bismuth salts of tannic acid are also used under the names of dermatol and airol.

Organo-Metallic Compounds

Some diseases, such as sleeping sickness and syphilis, have been traced to the presence in the blood of protozoal parasites. These parasites have been found to be very sensitive to certain organic derivatives of arsenic. The first of these was discovered by Béchamp in 1863 by heating aniline with arsenic acid and regarded by him as the anilide of arsenic acid. It was subsequently found when injected into patients suffering from sleeping sickness to have a remarkable curative effect, and was named aloxyl from its comparatively non-poisonous character. Bertheim and Ehrlich, who later examined the structure of the substance, found that it underwent the usual reactions of a primary amino compound, such as aniline, giving the ordinary diazo-reactions, etc. In this way it was recog-

nised that the compound was not an anilide, but p. aminoarsinic acid.

Its mono-sodium salt, which is the one generally used, is soluble in water. It rapidly destroys the trypanosomes of sleeping sickness, but is liable to produce blindness. From the fact that the introduction of an acetyl group into the p. aminophenol diminishes the toxic effect of this substance, the acetyl derivative of atoxyl or arsacetin was prepared with the same object and gave the desired result. The glycine ester is even more satisfactory.

Although atoxyl is able to destroy trypanosomes in the blood of the patient, it has little effect on the parasite outside the organism. Ehrlich therefore concluded that atoxyl undergoes reduction in the body, a change which confers upon it its special attribute. In this way he obtained amino arseno-

The substance has powerful trypanocidal properties and is much less toxic than atoxyl. The success of these experiments has led to the preparation of a great variety of arsenobenzene derivatives, of which the most valuable are salvarsan and neosalvarsan, used in the treatment of syphilis.

Neosalvarsan is prepared from salvarsan by adding an aqueous solution of formaldehyde sodium hydroxysulphite CH₂(OH)SO₃Na to an aqueous solution of salvarsan. It has the advantage of being readily soluble in a solution of sodium carbonate and therefore more readily applied. Many organic compounds of antimony have been examined, and excepting the salts of antimonyl tartrate (tartar emetic) few have so far found application in medicine. Mercury readily combines with organic subtances, many of which are of considerable value. For a mercury compound to be applicable in medicine it should not precipitate protein substances and should be capable of injection subcutaneously or intravenously without serious discomfort.

A very great variety of mercury organic compounds have been prepared and examined physiologically, among which mercurochrome (the mercury derivative of eosin) is stated to be a useful urinary antiseptic. Certain colloidal silver solutions and silver compounds of colloids are also employed as

protozoal and germicidal antiseptics.
Finally, mention may be made of new synthetic drugs obtained by modifying the natural product. Thus, Morgenroth by demethylating quinine, reducing it to hydro cupreine and then introducing different radicals into the hydroxyl group (RO) obtained a series of important germicidal products.

R. Hydrocupreine.

The methyl derivative is active against malaria and trypanosomes in animals, the ethyl compound or optochin is even more active and destroys pneumococcus in a dilution of one in a million, the isoamyl derivative or eucupin is an active poison for vibrios and diphtheria bacilli and the isoctyl com-pound known as *vuzin* destroys streptococcus and staphylococcus in a dilution of I in 80,000.

Although the subject of synthetic drugs as described in this article is far from complete, this brief survey will present a picture of the many directions in which organic chemistry is being used in the service of medicine. In spite of the large number of compounds which have found an application in medicine and the still greater number which after being produced are rejected, we are still profoundly ignorant of the relation which subsists between the structure of these substances and their action on the body. It is only when clearer views obtain on this subject that chemists will be able to work with the certainty of obtaining the results upon which they have embarked. In the meantime every new organic compound should be systematically tested for its physiological properties, for we are still in the empiric stage, and no opportunity therefore should be allowed to pass where there is a possibility afforded of discovering some new and possibly valuable drug.

The Colour of Organic Compounds

By C. Hollins, B.Sc., A.I.C.

MR. Moir, in a long series of papers (J. C. S. Aug. 1922 and earlier), has determined average factors by means of which he is enabled to calculate the absorption bands of a (limited) number of organic compounds. The following method appears to the present author to be simpler and shorter and it has the added advantage of giving the actual colour of a compound in

Let the six " primary " colours of the spectrum be represented in order by the first six prime numbers :

Red ... I Yellow... 3 Blue ... 7
Orange . 2 Green ... 5 Violet ... II
Thus 5 may be termed the "colour index"* of green, and

To find the colour of a given compound the number of letters in its name is first ascertained; this is the "literal." It only remains to determine the smallest prime number which, added This prime number is the colour index of the compound and reference to the above list gives the actual colour. An example will make this clear. Azobenzene has 10 letters; subtraction of I gives the perfect square 9; hence I is the colour index, and the colour is red. The more strictly correct name, benzeneazobenzene (17 letters, minus 1=42) gives

exactly the same result.

The wide applicability of this method of calculating colour is shown in the following table.

is shown in the following table	20	4		
,		Colour	Colo	our
Substance.	Litera	d. Index.	Calc.	Obs.
r. Azobenzene	10	(-) I	Red }	Red
Methyl Orange		(-) 3	Yellow	Reddish Yellow (solid)
2. \ Dimethylaminoazobenzene-				
Sodium dimethylaminoazo	37	(-) I	Red	Red(acid)
benzenesulphonate		(-) 3	Yellow	Yellow (alk.)
Aminoazobenzene	15	(+) I	Red)	Orange
3. Aminobenzeneazobenzene	22	(+) 3	Yellow	Crango
4. Naphthaleneazonaphtholdi-				
sulphonic acid (Fast Red B)	37	(-) I	Red	Red
5. Resorcinphthalein	26	(-) I	Red	Red
Eosin	5	(-) I	Red	Red
6. Tetrabromresorcinphthalein		(-) I	Red	Red
7. Diaminoacridine		(+) I	Red	Orange
Tetramethyldiaminoacridine	26	(-) I	Red	Orange
Fisetin		(+) I	Orange	Orange
9. Trihydroxyflavonol	18	(-) 2	Orange	Orange
10. Tetrahydroxyflavone	19	(-) 3	Yellow	Yellow
 Sulphobenzeneazophenyla- 				_
m nobenzene (Orange IV.)	34	(+)2	Orange	Orange
12. Flavinduline	12	(-) 3	Yellow	Yellow
13. Benzoquinone	12	(-) 3	Yellow	Yellow
14. Dianthraquinonylsuccina-				
mide (Algol Yellow 3G)	27	(-) 2	Orange	Yellow-

^{*} Not to be confused with the Colour Index now in course of issue in monthly numbers by the Society of Dyers and Colourists. Ours are limited to six numbers.

15.	Dinitrophenol Sodium nitrosonaphtholsul-	13	(+) 3	Yellow	Yellow
	phonate	31	(+)5	Green	Green
17.	Tetramethyldiaminotriphen- ylcarbonium chloride (Ma-				
18.	lachite Green) Dihydroxyanthraquinone-	44	(+) 5	Green	Green
	quinoline (Alizarine Green)		(+) 5 (+) 5	Green	Green
19.	Alizarine Cyanine Green Diparatolylaminoanthraqui-		(+) 5	Green)	
	nonedisulphonic acid Diparatoluidoanthraquino-	44	(+)5	Green	Green
	nedisulphonic acid	41	(-) 5	Green)	
20.	Alphanaphthaquinonedi- methylaminophenylimide				
21.	(Indophenol) Sodium dibetanaphthylros-	43	(-) 7	Blue	Blue
	anilinedisulphonate (Brillt. Dianil Blue)	42	(4) 7	Blue	Blue
4	Dianisidinedisazobisbeta-	4-	(+) 7	Ditte	Diuc
22.	naphthol Dimethoxydiphenyldisazo-	32	$(-)_{7}$	Blue	Blue-
(bisbetanaphthol Diethylsafraninetrisazotris-	38	(+) 11	Violet 5	violet
23.	Diethylsafraninetrisazotris- dimethylaniline (Diazine				
	Green)	42	(+)7	Blue	Pure
24.	Hydroxybenzeneazodiphen- ylazoaminonaphtholazoni-				Blue (i
	trobenzenesulphonic acid (Diamine Green B)		(-) 7	Blue	Greenis
		71	(-) 7	Diue	blue
25.	Pentamethylrosaniline (Methyl Violet)	25	(+) 11	Violet	Violet
26.	Oxaminodianisidineazophe-				
	nylaminonaphtholsulphonic acid		(+) 11	Violet	Violet
TO I			-4 3-	C	C -1 14

These examples are chosen almost at random from Schultz's Table of Dyestuffs and from amongst common organic compounds. Doubtless many others could be found. There are cases (e.g., the acridines, Nos. 7 and 8) where the agreement is less good than in others; fuller information and more correct naming will probably bring these into line. In benzene (literal=7, colour index=2—i.e., orange) doubtless the colour is "latent."

The method may prove of use to the research chemist, for given the colour of the substance the length of its name is limited to quite a few sets of numbers.

Referee's Gallic Acid Decision Improperly Excluded from Board of Trade List

The following is the Referee's decision in the Gallic Acid case: The complaint in this case is that gallic acid has been improperly excluded by the Board of Trade from the lists of articles dutiable under the Safeguarding of Industries Act. Gallic acid was originally included in the list. Complaint was made of this inclusion, and the Board of Trade took it out of the list in the belief that it was covered by something I said in the tartaric acid case. There was not any real contest at the hearing before me. None of these persons who might be interested in maintaining the exclusion of the substance from the list attended to take part in it. I am satisfied that the usual notices have been given and that persons interested have had the usual opportunities of giving evidence and of taking part in the argument. I regret that not one of them has availed himself of these.

On the evidence of Mr. Hill and Mr. Rose and of the chemical journals and catalogues that were put in I find that gallic acid has been, and is regarded by the trade as a fine chemical. I think, therefore, that the original inclusion of the substance in the list was right, and that its present exclusion is wrong. The reason for this exclusion is the supposition that in the tartaric acid case I defined a heavy chemical as a commercial product mainly used for industrial purposes. It is said that as gallic acid is a commercial product almost entirely used for industrial purposes therefore it is a heavy chemical. So far from laying down any definition in the tartaric acid case of the terms "heavy" and "fine," I expressly decided that there was no scientific or trade definition of the terms, and that therefore the test was the trade classification in each particular case. The view that I intended to express in the tartaric acid case was this: There was no

definition of "heavy" or "fine," but that in ascertaining how any particular substance had been regarded by the trade one would probably find that the purpose to which the substance had been put had had a good deal to do with its classification, and that for the most part chemicals mainly used, and used to a substantial extent in industry had been classified as "heavy."

I do not think that this applies to photographic chemicals. As to gallic acid the total quantity used in a year is comparatively small, and I find on the evidence that the trade has regarded it as a fine chemical. Applying therefore the same test as that applied in the tartaric acid case I come to the conclusion that gallic acid should be included in the list, and so I award. No costs are allowed.

The Polarity of Double Bonds

Professor Lowry's Novel Theory

At a meeting of the Chemical Society, held at Burlington House, London, on October 19, Professor T. M. Lowry put forward a novel theory as to the nature of double bonds in organic compounds. He suggested that, whilst a single bond must be either a covalency or an electrovalency, a double bond might contain one valency of each type, i.e., one polar valency of the Berzelian type and another of the non-polar type as applied by Kekulé to organic compounds. The sign of the polarity of the double bond might be determined either theoretically, e.g., by the magnitude of the nuclear charge of the atom, which would tend to make oxygen and nitrogen less ready than carbon to lose an electron and thus assume a positive charge, or experimentally by Lapworth's method,

in which a polar agent such as HBr or HCN is used to form an additive compound in which the hydrogen is added preferentially to the negative pole of the double bond and bromine or cyanogen to the positive pole. If additive compounds of this type are not formed the double bond may be a double covalency, as in oxygen O=O or carbon dioxide O=C=O.

Owing to a special quality which is possessed by electrovalency but not covalency, this method of formulation obliterates the distinction between the single and double bonds, (i) in conjugated compounds, (ii) in the ions of the carboxylic acids, e.g.,

and (iii) in benzene and other aromatic compounds. Thus, in butadiene

it is seen that the ends of the chain carry opposite electric charges, and are therefore just as much unsaturated as the two double bonds shown in the conventional formula; when these are saturated with bromine the two inner carbon atoms, which already carry opposite charges, are seen to be unsaturated, without requiring any shifting of a double bond as in the conventional formula for the compound. This conception can also be expressed by writing the compound as $CH_2 = CH = CH = CH_2$.

In the case of benzene the theory of mixed double bonds leads to the formula

in which again no distinction appears between the single and the double bonds of the Kekulé formula. As in ethylene the polarity of the individual carbon atoms will be determined by the substituents, and opposite polarity might be expected to occur in phenol and in nitrobenzene.

Assuming that a nitro-group, in which the nitrogen atom is positively polarised, would tend to attach itself to a negatively charged carbon atom, it is clear that substitution should take place in the ortho and para positions in phenol and in the meta position in nitrobenzene; again, the ready displacement, by $-OCH_3$ or $-NHCH_3$, of a nitro-group which has wandered into the ortho position relatively to another nitro-group can be explained by the conversion of "crossed" into "concordant" polarities, since the polarity of the nitrogen atom is of opposite sign in NO_2 and NH_2 .

Laws of Substitution Explained

The new formula, which is in many respects a summary of the earlier formulæ, has as its principal features (i) the fact that it makes the bonds between the atoms identical all round the ring, whilst (ii) it distinguishes between the alternate atoms of the ring, which are represented as being positively and negatively polarised. It therefore shows no difference between the $\mathbf{r}: 2$ and $\mathbf{r}: 6$ positions, but explains the two different laws of substitution by assigning different structures to derivatives of benzene which obey the orthopara and the meta law.

When applied to naphthalene and anthracene the special property of electrovalencies, which has been referred to above, makes it unnecessary (as in the centric formulæ) to break the bond which is common to the two rings. These compounds are therefore represented as

Finally, in the case of graphite a structure is suggested in which all the bonds in a double layer of atoms are held together by covalencies, whilst the successive layers are held together by electrovalencies.

The author stated that the formulæ he had put forward were based upon an adaptation of the octet theory, but time did not allow this aspect of the subject to be developed.

German Oils and Fats in September

Dealing with the Hamburg market in oils and fats during September, Consul-General Olivers states that during the early part of the month prices fluctuated only slightly, business moving within moderate limits. The approaching 60 per cent. rise in railway rates in October, together with the further depreciation of the mark, led, however, to some increase of business towards the end of the month, but the importation of oils and fats has on the whole been steadily decreasing, and many works have closed down wholly or partially owing to the difficulty of obtaining raw material. Prices, on September I and September 30 respectively, were as follows: Linseed oil, 285 mk., 325 mk.; palm kernel oil, 260 mk., 300 mk.; coconut oil, sebacic acid, 240 mk., 280 mk.; American turpentine oil, 610 mk., 800 mk.; cod liver oil (light), 185 mk., 250 mk.; beef tallow (technical), 240 mk., 310 mk.; castor oil, 295 mk., 365 mk.; bone glue, 215 mk., 280 mk.; taurocolla, 250 mk., 370 mk.

Presentation to Mr. H. Talbot

There was a convivial gathering of some 30 members of the Chemical Engineering Group of the Society of Chemical Industry at the Hotel Cecil on Friday, October 20, when the presentation to Mr. H. Talbot, Hon, Secretary of the Group, was made by Mr. J. A. Reavell, Chairman of the Group. In making the presentation of a cabinet of cutlery and a liqueur and coffee table cabinet, Mr. Reavell referred to Mr. Talbot as a "generous hearted, top-hole white man," and that spirit pervaded all the subsequent felicitations which were showered upon Mr. Talbot. Over the many allusions to Mr. Talbot's future life we will draw a veil; over his past life those who knew him intimately generously refrained from exposing him. So the evening passed in joviality, with some good songs by Mr. Paul Tingey and Mr. H. Child, and selections by a "syncophated" band which some of those present designated by quite another name before the evening was over. There was only one touch of seriousness in the whole proceedings, and that was when Professor J. W. Hinchley replied to the toast of "The Chemical Engineering Group." There was a feeling, he said, in some quarters that the new Institution of Chemical Engineers would destroy the Chemical Engineering Group. Nothing could be further from the truth; the fact was that the Group would be the more healthy for the existence of the Institution, which would be a qualifying body. The Group had for its object the dissemination of the principles of chemical engineering because in the future every industrial country would depend for its position upon the progress and development that was made in chemical engineering.

Distribution of Nauru Phosphates

In the Australian House of Representatives recently Mr. Hughes, the Prime Minister, was asked a series of questions regarding the business done at Nauru Island by the British Phosphate Commission. According to a *Times* correspondent, Mr. Hughes said that for the first two years under the Commission (July 1, 1920, to June 30, 1922) 319,220 tons of rock phosphate, obtained solely from Nauru, were brought into Australia. From that amount of rock nearly double the Australia. From that amount of rock nearly double the weight of superphosphate was manufactured, worth approximately £3,750,000. Australian farmers were charged for the superphosphate from £5 10s. to £6 12s. 6d. per ton in the different States, the average price being about £6. These prices were now falling in consequence of prices of raw material being considerably reduced by the Commission from July I, 1922. Prices in New Zealand were slightly higher than in Australia. The report and balance-sheet of the British Phosphate Commission for the year ended June 30, 1921, shows that the distribution of shipments was 72 96 per cent. to Australia, 4'70 per cent. to New Zealand, 4'59 per cent. to the United Kingdom, and 17.75 per cent. to other countries. trading account for the year showed that phosphate sales and sundry credits amounted to £1,304,739 13s. 11d. The debit side of the account showed f.o.b. cost of phosphate, including interest on capital, contribution to a sinking fund for the redemption of capital, and other charges in accordance with Article 11 of the Agreement of July 2, 1919, at £688,957 10s. 2d.; phosphate freights at £613,096 148, 6d.; balance appropriated to a reserve account at £2,685 9s. 3d.; total, £1,304,739 13s. 11d.

New Degree in Dye Chemistry

The degree of Bachelor in Colour Chemistry has been created at Manchester College of Technology. The degree, Dr. F. M. Rowe explained on Monday, is established in order to train chemists for the dyestuffs industry. Beginning from this session it will be possible to obtain the degree of B.Sc.Tech. in the section of colour chemistry. Students are being encouraged to carry out some of their experiments with miniature plant, because, although at the moment the dye stuffs industry is no doubt staffed to capacity with the large numbers who entered it during the war, it is anticipated that new research workers will be needed as dyemaking develops in this country.

The Uses of Dekalin

To the Editor of The Chemical Age.

Sir,—The very interesting article on Dekalin, which appeared in your issue of the 21st inst., is of particular value to me, as I happen to be the pioneer in the matter of introducing Dekalin to the paint and varnish trades. The report you give in full, under the names of two experts, Messrs. Coleman and Bilham, fully confirms the claims I made for this aromatic hydrocarbon in your own columns, more than a year ago. I am able to support these claims by adding an interesting fact, namely, that one of our leading railway companies is a constant and regular user of Dekalin.

The reception given to my efforts to introduce Dekalin, at times when turpentine ruled very high in price—to-day it costs twice as much as Dekalin—has been sometimes successful, occasionally amusing, and, now and then, rather vexing. More than one large firm in the paint trade has been good enough to suggest that my attempts to sell decahydronaphthalene as a "substitute" for turpentine are fully on a par with the efforts of the gentry who "sand" the sugar, water the milk, or engage in the nefarious practice of hawking wooden nutmegs!—Yours, etc.,

W. STANLEY SMITH, Lieut.-Col. Dacre House.

October 23, 1922. Victoria Street, London, S.W.1.

Electrolytic Zinc Progress

The report of the directors of the Electrolytic Zinc Co. of Australia, Ltd., for the year to June 30 last, states that important improvements have been effected in the company's process and its application, and the general manager states that possibilities of further satisfactory developments are indicated by recent work. Constructional work is approaching completion and the full plant, with an estimated output 120 tons zinc daily, should be ready before January 1 next, when 30,000 h.p. should be available. The board's anticipation that the hydro-electric department would be ready to supply the third block of power some months before the contract date has unfortunately proved impossible of realisation. Additional roasting furnaces are being erected at Port Pirie to operate in conjunction with the new acid plant to provide acid for fertilisers. An agreement has been concluded with the Sulphide Corporation, Ltd., for roasting approximately 30,000 tons of concentrates annually at Cockle Creek, the resultant acid being also utilised mainly for superphosobates.

for superphosphates.

Apart from the deliveries of zinc under the contract with the Board of Trade and the quantity sold locally, a substantial tonnage has been sold in the Eastern markets in competition with well-known and established producers of America and Europe. Not the least encouraging feature of this Eastern business is the confirmation it affords of the belief of the founders of this industry that it could export and market its products successfully in the face of competition with other countries. Investigational work on the Mount Read and Roseberry and the Hercules mines' complex ores has steadily advanced, and a programme of future activities will in due course eventuate.

(Continued from page 599). render the dyeings extremely fast. By the action of formal-dehyde on a mixture of o- and p-toluidine, a compound is obtained which goes under the name of Solidogen, and which is used for the after-treatment of substantive dyes, particularly of the Congo class. Finally, we may mention the use of formaldehyde in the preparation of a large number of materials which are employed for stripping colours from cotton and wool. The sodium sulphoxylate—formaldehyde compound is the well-known Rongalite C conc., also known as Hydrosulphite NF conc. and Hydralite C extra. The basic sulphoxylates of zinc in combination with formaldehyde are marketed under the trade names of Decroline, Hydrosulphite AZ and Hydalite Z.

None of the other products obtained from the destructive distillation of wood have so far found any application in the dye industry. Charcoal and the wood tars and oils are products for which there is no extensive market to-day. If uses comparable with those outlined could be found for these materials, wood distillation would be much more flourishing and the outlook for the industry a much brighter one.

International Awards for Research

THE Awards Examination Committee of the International Metallurgical and Chemical Society announces that the organisation has three research medallions which are open to the scientific public as competitive awards

The medallions will be awarded for the best thesis, or in the case of an invention or discovery, a copy of the patent specifications, of any chemical, metallurgical or allied scientific investigation or advancement. The research data will be judged as far as possible upon (1) general results of investigation, (2) originality of the research, (3) potentiality of the investigation.

The regulations connected with the submission of manuscripts, monographs, etc., are: (a) Investigation and research must be performed by submitter; (b) if the thesis is for graduation this fact to be stated, with name of institution, year and degree; (c) whether results have been published in full or part, if so state periodical and issue; (d) date and place investigation was conducted. In case of award publication rights are retained by the organisation; submitter to have republishing rights.

It is intimated that submissions should be made as soon as possible, as awards will be granted from time to time as sufficient material is co-ordinated. Submissions for these awards should be sent sealed, postpaid, to Roy Franklin Heath, D.Sc., Secretary, P.O. Box, 270, Billings, Montana, U.S.A.

Great Pioneers of Chemistry

At the University College, Dundee, on October 20, Professor A. M'Kenzie lectured on "Priestley and Lavoisier, Pioneers in the Chemistry of Air." In the course of his remarks the lecturer said it was difficult to throw ourselves back to the latter part of the eighteenth century, when Priestley and Lavoisier carried out their pioneering work, and to realise that at that time chemistry as a science probably did not exist at all. The art had been practised by the Egyptians and Greeks, but scientific chemistry could hardly be said to have begun before the time of Robert Boyle in the seventeenth century. Priestley was a remarkable man in his many-sidedness. He was not only a great chemist, but he was alsoknown for his contributions to theological literature. Lavoisier also made all-important discoveries in the nature of rusting and combustion. The writer of a French text-book had commenced with the remarkable statement: "Chemistry is a French science; it was founded by Lavoisier of immortal memory." Lavoisier certainly played a great part—perhaps a principal part—but there were others. One might as well claim chemistry was a "Scottish science founded by Joseph Black of immortal memory," for he, too, had played a great

Australian Carbide Regulations

A FURTHER embargo has been placed by the Australian Government on the importation of carbide, and this action has prompted many questions in the Federal Parliament and in the Press. The importation of carbide was prohibited in December, 1920, for a period of twelve months. When the prohibition was about to expire it was found that foreign carbide was being offered to Australian buyers to the detriment of the local industry in Tasmania. It was therefore decided to continue the prohibition pending an inquiry by the Tariff Board, which is now investigating the matter. At present business houses are not permitted to sell imported carbide except at Tasmanian prices. The duty on carbide per ton in the Australian tariff is £4 for British and £7 tos, for foreign.

A New Bottle-Capping Solution

A PREPARATION which is intended to replace white kid and other materials used for "draping" the corks and necks of bottles is now being placed on the market by the Unit Manufacturing Co., of 171A, Landells Road, East Dulwich, Surrey, Known as the "Unit" liquid kid bottle-capping solution, it consists of a white fluid into which the bottle may be dipped; alternatively it can be applied to the cork and bottle neck by means of a brush. The article treated is then left for two hours, at the end of which time the solution has dried a tough matt white.

Society of Chemical Industry Nottingham Section

THE Chairman of the Nottingham Section of the Society of Chemical Industry, Mr. S. H. Burford, F.I.C., delivered his inaugural address on October 18th, choosing as his subject "Industrial Chemistry: Its Importance and Progress." In the course of his address, the Chairman said the resources of chemical science, although organised and pooled by such bodies as the Society of Chemical Industry, and at the close of a period of good resolutions, had not even yet been fully utilised. There was a necessity for economic foundations and urgent need for enterprise by municipal and trading corporations in the disposal of waste products, especially sewage and in the more efficient use of coal. The business man was too much inclined to wait and profit by the results freely offered by disinterested investigators, as in the papers published by Richmond, Trotman and Wood in this section.

Real advances in industry, leading to great rewards in business were only to be obtained by adequate preliminary expenditure which might be regarded as a form of insurance

In the discussion which followed several examples were given of neglect to apply the resources of science. Thus the Germans had specialised in the sometimes unpleasant but profitable "waste" trades. After 1900 they had nearly succeeded in destroying the British industry of animal by-products by changing it from an empirical to a scientific basis. Great quantities of coal lay unused at the collieries, and the chemist in charge was too often given no opportunity of earning his salary. Monopol soap, so largely used in the bleaching and dyeing industries, was an imported article.

Retirement of Professor Smithells

PROFESSOR ARTHUR SMITHELLS, who has held the Chair of Chemistry at the Yorkshire College of the Leeds University since 1885. has announced his intention of retiring next June in order to take up special research work in London. Prior to his present appointment, Professor Smithells was demonstrator and assistant lecturer in chemistry at Owens College, Manchester. In 1913 he went to India for six months to give a course of lectures in Lahore and to give assistance to the Punjab University in the promotion of scientific education and research. During the war he was attached for a time to the Northern Command as civilian lecturer on gas warfare, and was afterwards entrusted with the duty of organising and superintending home training in anti-gas measures. On being appointed Chief Chemical Adviser at the General Headquarters of the Home Forces in London he was given the rank of lieutenant-colonel and was subsequently made a C.M.G. A Fellow of the Royal Society since 1901, Professor Smithells holds, or has held, important positions in connection with the Society of Dyers and Colourists (of which he was first President), the Chemical Society (vice-president), and the Institute of Chemists (member of the Council and Fellow).

"The Chemical Age" in America

Speaking at the opening meeting of the New York Section of the American Chemical Society, Mr. F. E. Hamer (editor of The Chemical Age) said there was an almost surprising similarity between economic conditions in British chemical industries and those in the United States of America. Politically, however, he was inclined to believe that the former enjoyed some advantage, for the Government had carried out the promises it had made to the industry.

The Safeguarding of Industries Act, even with its shortcomings in administration and a strong opposition from the merchant class, had recently received a decidedly favour-able vote of confidence by the British Parliament. Much of the credit for the general active condition of the British industry was due, he believed, to the energetic work of the Association of Chemical Manufacturers and its general manager, Mr. Woolcock; to the Chemical Engineering Group, and various kindred organisations.

Mr. Hamer left New York on October 15 for Washington and Philadelphia. He also intends to visit Baltimore, Wilmington, and a number of other industrial centres before returning to England.

A New Insulation Tester

"Meg," besides being a possible designation for the feminine of the species, is now the cognomen of an electrical instrument. Her (or its) genealogy is something as follows: Electrical resistance brought into being the ohm, and to avoid mental overstrain from the carrying of strings of figures in the head, insulation resistance brought into being the megohm. To measure the megohm the ohmmeter and generator was invented in 1888 by Mr. Sydney Evershed, and to make the instrument more portable and easy to use the "Megger' resulted about 1903. But in order to obtain an apparatus which is lighter and more portable and less expensive even than the "Megger" has been the endeavour for some time of Evershed and Vignoles, Ltd., of Chiswick, and the result is

the "Meg," which is being placed on the market to-day, and which is briefly described below.

It is not claimed for the "Meg" that it has all the advantages of the "Megger," but it is claimed that it performs all the necessary insulation tests at a reasonably high pressure, at present standardised at 500 V, and is moreover so cheap that a contractor can multiply his testing facilities at a reasonable cost. In addition, the weight of the instrument has been reduced to 63 lb., as against 13 lb. of the lightest type of "Megger," the size has been reduced, the overall dimensions being only 5½ in. by 7½ in. by 6½ in., the set is practically watertight, and the terminals do not project from the instrument, and are therefore not liable to accidental

damage.

In essentials, of course, "Meg" does not differ from either the "Megger" or the ohmmeter and generator. That is, a generator provides the necessary testing power, and an ohmmeter records the results. But various features which make for an easy and foolproof carrying out of the work have been introduced.

The case, which is of cast aluminium, has one end formed into an oiltight gear-box. In this box steel gear of concentric type is entirely enclosed, so that it is kept clean and thoroughly lubricated. The teeth on the annular wheel are drifted out, and on the others cut on the hobbing machine. The driving handle is of such a shape that it is naturally protected by the box. It is fitted with a free wheel which consists of a snug on the shaft expanding a stud into the annular space in the armature shaft. This device protects the gear from damage, and prevents the armature from being turned the wrong way.

At the further end from the handle an element of the case contains the ohmmeter and protects the "Line" and "Earth" At the top a glass window with hinged cover gives a view of the dial. The carrying handles hang at the side of the case entirely out of the way when "Meg" is in use, but meet together in a flat spring catch which lies comfortably in the hand when the instrument is carried. This construction has been rendered possible by the system of guarded circuits used, and by the introduction of a number of other features in both generator and ohmmeter. The reduction in weight compared with all that has gone before has not been obtained at the expense of working forces, for these are large in proportion to the mass and inertia of the movement, giving great promptness and precision in the indications. Patented spring jewels are employed for the movement, and give security against damage by careless usage.

Indigo Crop of the Madras Presidency

According to an official report on the indigo crop of the Madras Presidency in 1921-22, the area sown with indigo in the Madras Presidency up to the end of August, 1922, is estimated at 102,600 acres as against 114,500 acres last year, a decrease of about 10 per cent. The area in Cuddapah has increased by 50 per cent. owing to good rains in June. There has been a decrease in all the other main tracts owing to want of good sowing rains and to the gradual decline in exports, as a result of the increasing competition of synthetic dyes. The price of indigo between December and M was less than in the corresponding period of last year. crop suffered from drought in most places and yields below normal are reported. There is no reliable information as to the percentage of the crop actually manufactured into dye. But if the whole crop were manufactured into dye, the possible yield would be about 1,150 tons.

From Week to Week

Mr. A.W. ASHCROFT was unanimously elected president of the

association for 1923.

MR. W. DUNCAN KNIGHT, a director of John Knight, Ltd., has died at Horsham in his 78th year.

IT IS REPORTED that the African Oil Mills, Liverpool, have now been taken over by the Co-operative Wholesale Society, Ltd. PREPARATIONS are being made for brine borings near Sandbach, Cheshire, with a view to the erection of new salt-

MR. T. W. McMullan, M.P., of Thomas McMullan and Co., manufacturing chemists, has been elected a patron of Belfast

Arts Club.

Dr. F. W. Atack has been appointed a member of the board of the Southern Dyestuffs Co., of 505, Fifth Avenue,

SIR WILLIAM BRAGG lectured on October 21 at the Working Men's College, Crowndale Road, London, N.W.I, on "The Structure of Crystals."

MR. JULIUS ARTHUR BREWIN and Mr. Louis John Hunt have been elected Prime Warden and Renter Warden respectively,

of the Dyers' Company.

DR. PERCY LONGMUIR, of Sheffield, has been appointed

Director of Research to the British Cast-Iron Research Association, and will take up the position on November 1.

AIKMAN (LONDON), LTD., announce that their address is now Stafford House, 14-20 King William Street, London, E.C.4. Telephone: Central 3572 (three lines). Telegraphic address: Aikman, Cannon, London.

FORMERLY EMPLOYED at the Powder Mills, Battle, when the town was a centre for gunpowder making, Mr. James Morgan died at Battle on October 19, at the age of 99. He had lived at the Powder Mills for the greater part of his life.

AN ENGAGEMENT is announced between Howard Raymond, eldest son of Mr. and Mrs. Howard Feeney, of Mannering Road, Liverpool, and Kitty, the elder daughter of Mr. and Mrs. Max Muspratt, of The Grange, Fulwood Park, Liverpool. Professor C. H. Desch will deliver the fifth annual Streat-

field Memorial Lecture in the Chemical Lecture Theatre of the Finsbury Technical College, Leonard Street, London, E.C.2, on Thursday, November 2, at 4 p.m. The subject will be "The Metallurgical Chemist."

Major James Yule Deeley, of the Yule Metal and Chemical Co., Nottingham, was found dead in his office. At the inquest on October 19it was stated that death was due to a sudden collapse, and that he had been dead for 48 hours when

found. A verdict of death from natural causes was returned.

IN THE COURSE of a lecture on "Essential Oils" at the first meeting of the session of the South Wales section of the Society of Chemical Industry, Dr. W. J. Jones showed how a minute proportion of a chemical substance could modify the perfumery or medicinal value of the oil. The nose remained far more sensitive to minute chemical impurities

than any analytical method yet known.

Among the probable papers for reading at a meeting of the Royal Society, on Thursday, November 2, are:—" The Scattering of Hydrogen Positive Rays and the Existence of a Powerful Field of Force in the Hydrogen Molecule," by G. P. Thomson: communicated by Sir J. J. Thomson, F.R.S.; and "The Absorption Spectrum of Potassium Vapour." by S. Datta: communicated by Professor A. Fowler, F.R.S.

Professor Thomas Turner, in his presidential address

to the members of the Metallurgical Society of the University of Birmingham, on Wednesday last, stated that a large amount of research work was done last year. It had relation particularly to experiments in steel and non-ferrous metals, and to the properties of refractories and fire-clays. "The Turner Medal" and £10 worth of books were presented to Mr. Harold Wiggin for his work during the year. The prize was the outcome of an anonymous donation of 500 gs., as an expression of appreciation of the researches made under the direction of Professor Turner.

Dr. J. SMEATH THOMAS, senior lecturer on analytical chemistry at the University of Liverpool, opened the winter ession of the Liverpool Chemists' Association at the Royal Institution, Liverpool, on October 18. In an address on "The Ultimate Nature of Things," Dr. Thomas outlined the research work he had carried out and advanced the latest theories on the nature of atoms and molecules. In this branch of knowledge, he said, scientists were on the eve of discoveries which might have important effects upon civilisation. atom was no longer regarded as the irreducible unit, but as a miscroscopical solar system A source of energy beyond the dreams of the past might be liberated.

THE NEXT MEETING of the Society of Public Analysts will be held on Wednesday, November 1, at the Chemical Society's be field on Wednesday, November 1, at the Chemical Society's Rooms, Burlington House, Piccadilly, London, W., at 8 p.m. It is anticipated that the following papers will be read:—"The Colorimetric Estimation of Pyrogallol, Gallotannin and Gallic Acid," by C. Ainsworth Mitchell, F.I.C.; "The Estimation of Narcotine and Papaverine in Opium," by H. E. Annett, D.Sc., F.I.C., and M. N. Bose; "The Estimation of Morphine," by J. R. Nicholls, F.I.C.; and "Further Notes on the Estimation of Potassium; by Perchlorate and Cobaltinitrite Methods," by R. L. Morris, F.I.C. Arrangements have been made for members and their friends to dine together at St. Lower. members and their friends to dine together at St. James' Restaurant, 178, Piccadilly (opposite Burlington House), at 6.30 p.m.

HE FIRST MEETING of the Glasgow Section of the Society of Chemical Industry was held on October 20, in the rooms of the Institute of Engineers and Shipbuilders, under the presidency of Mr. W. E. Moody, F.I.C., the new chairman of the section. Dr. H. Hepworth read a paper on the "Synthesis of the Tannins," in which he traced briefly the ancient history of the tanning of hide, and then gave an outline of modern research on the chemical constitution of tanning materials. The chief worker in this field was Dr. Emil Fischer, who in his research prepared the most complex chemical compound that man had ever made. But the lecturer added that in the general problem of the constitution of tanning materials a large and almost untrodden field lay open to the chemical

investigator.

AT THE ANNUAL MEETING of the Governors of the Royal Technical College, Glasgow, held last week, Sir George Beilby, who presided, was re-appointed chairman, and Dr. MacKenzie vice-chairman. The report stated that research work was extending rapidly in volume and importance. The main function of the college, it was pointed out, must always be educational, but the second was undoubtedly research. Each had a potent influence on the other. The successful application of the results of research to actual practice in chemical, metallurgical and engineering operations was drawing more closely the bonds between the college and the industries, and greater advantage was being taken of the opportunities for effective co-operation, which were bound to increase as industry became more scientific.

Tests made by the United States Bureau of Mines show that large supplies of smokeless powder left in the possession of the Federal Government at the close of the war can, in the form of comminuted smokeless powder, be used effectively for certain industrial blasting purposes. Field tests made by the Bureau at the explosives experimental station at Bruceton, Pa., have demonstrated the practical value of this powder for stump blasting, boulder breaking, and ditch digging purposes. As the result of experiments previously made by the Bureau in connection with the industrial utilisation of other types of military explosives, more than 34,000,000 lbs. of surplus trinitrotoluene, 13,000,000 lbs. of picric acid, and about 1,000,000 lbs. of "grenade powder" have been allotted by the War Department to other departments of the Government.

The following papers are expected to be read at a meeting of the Chemical Society, on Thursday, November 2, at 8 p.m.:

—"The Solubility and Volatility of the Nitrobenzaldehydes," by N. V. Sidgwick and W. M. Dash; "Investigations on the Dependence of Rotatory Power on Chemical Constitution (Part XIII), The Spatial Configuration of the Unbranched Aliphatic Chain," by R. H. Pickard, J. Kenyon and H. Hunter; "Investigations on the Dependence of Rotatory Power on Chemical Constitution" Part XIV, "The Normal Aliphatic Ethers of D-β-Octanol," by J. Kenyon and R. A. Mc-Nicol; Part XV, "The Normal Aliphatic Ethers of D-Methyl Benzylcarbinol," by H. Phillips; Part XVI, "A New Type of Walden Inversion," by H. Phillips; Part XVI, "The Di-D-β-Octyl Esters of the Acids of the General Formula (CH₂)_n (COOH)₂," by L. Hall; "Orientation of the I:4-and I:5-Dimethylglyoxalines; Mode of Fission of 5-Aminoglyoxalines," by F. L. Pyman; "Bromo-Derivatives of 2-Methylglyoxaline," by L. Light and F. L. Pyman. of the Chemical Society, on Thursday, November 2, at 8 p.m.

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Patent Literature

Abstracts of Complete Specifications

185,842. ELECTROLYTIC TREATMENT OF METALLIFEROUS MATERIALS CONTAINING TUNGSTEN OR MOLYBDENUM. R. E. Pearson, Duram Works, Nightingale Road, Hanwell, London, W.7, E. N. Craig, Beaufort House, Ham Common, Surrey, and Durelco, Ltd., Thanet House, Strand, London, W.C.2. Application date, June 11, 1921.

Certain impurities which occur in tungsten or molybdenum or their ores are oxidised by making use of the anode reactions in an electrolytic cell. The electrolyte may be acid or alkaline. If acid, the tungstic or molybdic oxide produced is insoluble in the electrolyte, but the oxides of metals usually present as impurities, such as iron, manganese, tin or magnesium, are in general soluble in the electrolyte. If the electrolyte is alkaline, the tungstic or molybdic oxides are soluble, but the impurities are not. In an example, crude molybdenite is finely ground and made into a paste with the electrolyte, and then placed on a horizontal anode. Iron and alumina are dissolved and the sulphide of molybdenum is converted into the insoluble oxide. In another example wolframite is similarly treated in an alkaline electrolyte, with the result that insoluble higher oxides of iron and manganese are produced, and a solution of sodium tungstate is obtained. In another example, an impure metallic powder obtained by a reduction of the yellow oxide of tungsten with hydrogen, is treated by this process using a sulphuric acid electrolyte with a nickel-chromium cathode and a lead anode. The alkali or acid employed as the electrolyte is chosen according to the impurities present, e.g., oxalic acid, hydrochloric acid or sulphuric acid may be used when the predominating impurities are sodium, iron or carbides respec-

185,880. DIRECT DYEING COTTON COLOURS, MANUFACTURE AND PRODUCTION OF. British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London; J. Baddiley, J. B. Payman, and E. G. Bainbridge, Crumpsall Vale Chemical Works, Blackley, Manchester. Application date, June 28, 1921.

Pyrazolone dyes containing two aryl-benzthiazol residues, and having a great affinity for unmordanted cotton, are produced by the reaction of two molecular proportions of the hydrazine derived from a thiazol and one molecular proportion of dioxy-tartaric acid, or one molecular proportion of the thiazol hydrazine and one molecular proportion of aceto-acetic ester or oxal-acetic ester to form a pyrozolone, which is then coupled with a diazothiazol. These dyes are fast to light and washing. Examples are given.

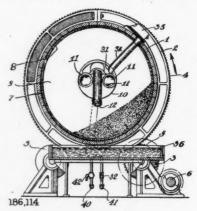
186,107. RESINS, MANUFACTURE OF. O. Y. Imray, London. From Society of Chemical Industry in Basle, Switzerland. Application date, June 9, 1921.

These artificial resins are produced by heating an oxy compound of an aromatic hydrocarbon with sulphur in the presence of a basic substance in proportion not greater than one-fifth of that necessary for neutralising the oxy compound. The product may be rendered infusible and insoluble by the action of heat or heat and pressure. These resins may be produced more cheaply than those of the phenol-formaldehyde type. The sulphur may be used in the proportion of 2 to 3 atoms to 1 molecule of phenol or cresol, and about half of this sulphur is evolved as hydrogen sulphide. Further quantities of sulphur and alkali sulphide may be taken up as a filling material. The reaction may be accelerated by the addition of a catalyst such as a halogen or a compound yielding a halogen. If a small proportion of formaldehyde is added, a harder resin is obtained. In an example, a mixture of phenol 47 parts and sulphur 32 parts is fused in a reflux apparatus, and 1 part of potassium hydrogen sulphide added and the mixture heated to 130°—140° C. The reaction continues with increasing temperature and terminates when the evolution of hydrogen sulphide ceases. A viscous fluid resin is obtained which becomes solid on cooling, and is soluble in alcohol, acetone, benzene, and alkalies, but insoluble in acids, aliphatic hydrocarbons, and halogen derivatives. The

resins becomes infusible and insoluble by prolonged heatin g to 150°–180° C. Other examples are given of the production of resin from (1) ortho-cresol, sulphur and potassium carbonate, (2) phenol, tricresol, sulphur and aniline, with a small proportion of iodine, (3) resorcinol, sulphur and sodium hydroxide, (4) α -naphthol or β -naphthol, sulphur and sodium hydroxide, (5) as in the first example with a small proportion of hexamethylene-tetramine which may be in aqueous solution.

186,114. WHITE LEAD, MANUFACTURE OF. A. E. White, London. From National Lead Co., 111, Broadway, New York. Application date, June 14, 1921.

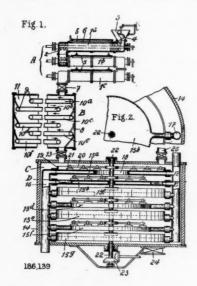
In the usual process for the manufacture of white lead, pulverised metallic lead is agitated in a closed rotating cylinder in the presence of carbon dioxide, air, water, and acetic acid, which converts it into the white basic carbonate. The mass in the cylinder is periodically sprinkled with a liquid reagent, so that a condition of alternative wetness and dryness is obtained. This usually results in agglomeration of the material, which sticks to the walls and has to be removed and broken up. In the present invention, the liquid reagent is introduced into the cylinder more frequently and in such quantity as to keep the mixture permanently moist, but not in a pasty condition. The quantity of liquid is preferably kept between 2 per cent. and 5 per cent. of the lead, and is supplied at intervals of four hours. In this process the corrosion period is reduced by two days, and a superior product is obtained with less tailings. The corroding cylinder consists of a long horizontal tube of wooden planks, bound with circular bands, which rests on supporting rollers 3. Driving



pinions 5 are provided at intervals along the cylinder to rotate it through toothed rings 4. The cylinder is lined with heavy paper 7, and covered with a layer of matched boards 8. The pulverised metallic lead is contained in a hopper at one end, provided with an adjustable gate to regulate the discharge, which is arranged immediately above a short travelling band. This discharges the lead into a feed hopper, and thence to a central spout 12 in the end of the cylinder. The treating gas is supplied through pipes 11 at each side of the lead supply pipe to avoid any dripping of moisture on the incoming lead. The conveyor band supplying the lead is driven by gearing from the rotating cylinder. The cylinder is rotated at about 6 revolutions per minute, and the passage of the lead takes about 5 days. At the discharge end of the cylinder the white lead is lifted by scoops into an extension having a grating to break up lumps, and then passes into a trough provided with a screw conveyor. The liquid reagent is supplied by a spraying device 32 from a tank 35. This tank is filled by its passage during revolution through a stationary tank 36. Acid is supplied at the inlet end of the cylinder, and water towards the discharge end. It has been found that the formation of larger particles of white lead is facilitated by relatively dry conditions in the cylinder, and the nature of the product may be varied accordingly.

186,139. GLUCOSE AND DEXTRINE FROM WOOD, PROCESS AND APPARATUS FOR OBTAINING. H. Terrisse and M. Levy, 74, Chemin Chandieu, Geneva, Switzerland. Application date, June 20, 1921. Addition to 143,212.

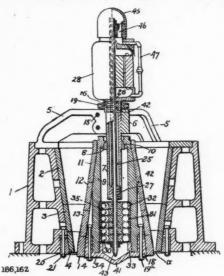
Specification No. 143,212 (see The Chemical Age, Vol. III; p. 137) describes a process for obtaining glucose from wood by the action of liquid followed by gaseous hydrochloric acid, and then digesting the material. In the present invention, the material is digested in thin layers after subjection to the acid at a temperature of 12°-50° C. The material is thus maintained in powdery form, and the saccharisation of the material and recovery of acid are facilitated. The raw material is dried until it contains about 5 per cent. of water, and 10 parts are mixed with 7-11 parts of 40 per cent. hydrochloric acid solution, and simultaneously supersaturated with 2 parts of gaseous hydrochloric acid. The mixture is then digested in thin layers at a slight increase of pressure. The mixture, which contains dextrine, is then freed from hydrochloric acid by heating to 15°-30° C. under reduced pressure, and then heating to 50°C. under a vacuum of 1-6 centrimetres of mercury. The acid may be recovered as compressed gas, and also as liquid, and may be used again in the process. The mixing apparatus A consists of three tubes 1a, 1b, 1c connected at opposite ends alternately, and constructed of acid-resisting material. The raw material (sawdust) is



transferred through the tubes by conveyors 2 and is treated in the tube 1a with hydrochloric acid solution supplied through a perforated pipe 6. Gaseous hydrochloric acid is supplied through similar perforated pipes in the tubes 1b, 1c. saturated material then passes into a digester B, where it is converted into a mixture of glucose and dextrine. The material passes slowly through the digester on a series of travelling bands 10a, 10b, 10c, 10d, 10e, in succession. The saccharised material then passes into an apparatus C for the recovery of hydrochloric acid. A number of horizontal plates 15a-15g are arranged one above the other, and are made hollow for heating by warm water or hot air supplied through a pipe 17. The plate 15a is provided with a central aperture 18 and a projecting rim 19, and the plate 15b has no central aperture or rim, and is of smaller diameter. The remaining plates are of similar constructions, and are arranged alternately. The material is conveyed over each plate by means of scrapers 21, either to the central opening or to the outer edge and thence to the plate next below. The material then passes from the outlet 24 to another similar apparatus where it is subjected to a higher vacuum to remove the remainder of the acid. The process is thus continuous. The product is then boiled to convert the dextrine into glucose and then filtered to remove the insoluble lignin. The slightly acid filtrate is neutralised and may be concentrated to form molasses or may be fermented to produce alcohol.

186,162. ORE CRUSHER. B. A. Mitchell, Garfield, Salt Laker Utah, U.S.A. Application date, June 22, 1921.

The die members 2, 3, 4 of the crusher are mounted in a frame 1, and a frame 5 is provided with a hub 6 carrying a vertical stud 7 provided with a universal bearing 8. The crusher head 9 is carried on the bearing 8 by means of a socket 10, and carries die members 11, 12, 13, 14, the lowest member 14 being of slightly smaller diameter than the lowest member 4, leaving an annular discharge slot a. The width of the slot a is varied by rotating the capstan nut 19 to lift the



crusher head 9. The shaft 25 is rotated at about 3,000-3,600 revolutions per minute by means of an electric motor 28. Balls 30 are arranged to revolve in races 31 but are located on one side only of the shaft, so that an unbalanced centrifugal effect is produced and a crushing action travels around the crusher head, while the latter has a rolling movement in contact with the ore between the dies. The stability of the crusher head is increased by gyroscopic action due to the high speed.

186,199. EXTRACTION OF ALKALI FROM FELDSPAR AND OTHER MINERALS CONTAINING ALKALI, PROCESS FOR. Plauson's (Parent Company), Ltd., 17, Waterloo Place, London, S.W.I. From H. Plauson, 14, Huxter, Hamburg, Germany. Application date, July 15, 1921.

It is found that the extraction of potash from feldspar is facilitated if the feldspar is submitted to a colloidalising treatment either before or during chemical or electro-chemical extraction in a colloid mill such as described in Specification No. 155,838 (see The Chemical Age, Vol. IV., p. 313). In one example, the finely ground feldspar is allowed to stand for some time with dilute hydrochloric, nitric or sulphuric acid, and then treated in a colloid mill. More refractory feldspar is treated as a pressure of 5-100 atmospheres with steam superheated to 125°-350° C. In another example the feldspar may be treated at 80°-100° C, in a colloid mill with water containing a small quantity of alkali or another substance acting as a dispersion accelerator. The alkali may then be extracted with superheated steam. In another example, the feldspar colloidalisation is subjected to electrolytic treatment. It is found that the extraction of alkali is facilitated if the feldspar is previously heated with carbonaceous material or with reducing gases such as producer gas or water gas.

186,223. Phosphorus Compounds Suitable for Manurial Purposes, Process for the Treatment of R. W. James, London. From Eisenwerkgesellschaft Maximilianshütte, Rosenburg, Upper Palatinate, Bavaria, Germany. Application date, August 9, 1921.

The process is for treating phosphoric compounds such as phosphorite (Florida phosphates and the like) apatite, osteolite, coprolite, bone meal, phosphate guano or phosphoric slags, to

convert them into a form soluble in citric acid and partly soluble The phosphoric compounds are intimately ground with alkaline salts, magnesia salts, alkaline-earth salts, alkali-magnesia or ammonium salts, such as sulphates, chlorates, silicates or nitrates. These salts may be employed in the form of kainite, schoenite, kieserite, carnallite and the like. This process is cheaper than treating phosphoric materials with sulphuric acid, and avoids the partial transformation of the water-soluble phosphate into tri-calcium phosphate which occurs in the latter case. Reference is directed in pursuance of Section 7, Subsection 4 of the Patents and Designs Acts of 1907 and 1919 to Specifications Nos. 6429/1906, and 151,024 (see THE CHEMICAL AGE, Vol. III., p. 454).

186,270. CHLORINATION OF METHANE. Holzverkohlungs Industrie Akt.-Ges. Konstanz, Baden, Germany, and K. Roka, Eichhornstrasse 23, Konstanz, Germany. Application date, November 22, 1921.

Methane is chlorinated at a temperature of 400°-500° C. in the presence of superheated steam as a diluting agent. About 2-5 volumes of steam are used for each volume of chlorine, but the proportion depends on the relative proportions of the gases used, or the dimensions of the reaction tube. Tempera-tures above 650° C. should be avoided to prevent dissociation of the steam. A catalyst may also be employed, such as a chloride of copper, iron, calcium, magnesium, etc. The necessary heat for the reaction can be supplied by the steam, thus avoiding external heating. The chlorination product, such as methyl chloride, is obtained by condensing the steam, so that the effluent gases are not contaminated by any other gases, and may be used again in the process. The proportions of chlorine and methane used depend on the nature of the chlorination products required. In an example, a mixture of methane 25 parts, chlorine 38 parts, and steam 100 parts, are treated at 400-500° C. without explosion or precipitation of carbon. The chlorine is then found to be present as CH₂Cl₂ 8%, HCl, 53%, CH₂Cl₂ 13%, CHCl₃, 20%, and CCl₄, 5%. By varying the proportion of the gases, the distribution of the chlorine in the products may be varied.

Note.—Abstracts of the following specifications which are now accepted appeared in The CHEMICAL AGE when they became open to inspection under the International Convention : 160,776 (S. F. Acree), relating to conversion of wood into sugar and other products, see Vol. IV., p. 626; 160,777 (S. F. Acree), relating to conversion of wood into mucic acid and other products, see Vol. IV., p. 627; 161,564 (A. D. Little, Inc.) relating to production of cellulose esters, see Vol. IV., p. 678; 165,408 (R. Pummerer) relating to production of artificial resins, see Vol. V., p. 252; 165,439 (E. I. du Pont de Nemours and Co.), relating to cellulose ester compositions, see Vol. V., p. 253; 165,728 (Elektrizitätswerk Lonza), relating to crotonic acid from croton aldehyde, see Vol. V., p. 286; 166,530 (Durand and Huguenin Soc. Anon.) relating to mordant dyeing colouring matters, see Vol. V., p. 383; 169,687 (Soc. Chimique de la Grande Paroisse), relating to brown dyestuffs, see Vol. V., p. 678; 182,820 (A. D. Little, Inc.), relating to cellulose butyrates, see Vol. VII., p. 391.

International Specifications not yet Accepted

107. ARTIFICIAL RESINS. Consortium für Elektro-chemische Industrie Ges., 20, Zielstattstrasse, Munich, Germany. International Convention date, August 27, 1921.

Resins obtained from aliphatic aldehydes are subjected to oxidation either in the molten state or dissolved or suspended in a liquid, yielding products which are soluble in aqueous solutions of borax and soda. The resin may be dissolved in glacial acetic acid and treated with ozonised oxygen, or with oxygen in the presence of manganese acetate. Water is added to precipitate the product. Alternatively, the resin is suspended in water containing potassium permanganate, and oxygen is passed through to oxidise it. The products may be hardened by heating and may be used in manufacturing oil varnishes.

LATEST NOTIFICATIONS.

- Recovery of lead-compounds. Nathansohn, A.
- October 13, 1921. 200. Manufacture of casein glue. New Zealand and Co-487,200. Operative Dairy Co., Ltd. October 10, 1921.

- 187,231 and 187,232. Production of chrome-alum. Chemische Fabrik in Billwarder, and Hasenclever, Dr. P. October 12,
- 241. Filters for fluids, more particularly for liquid hydrocarbons, such as petrol. Pethoud, S. E. October 15, 1921.
- Specifications Accepted, with Date of Application 160,840. Nutritious fats, Manufacture of. G. Schicht Akt.-Ges.
- and A. Grun. April 1, 1920.

 165,794. Dry distillation process. H. G. Hennebutte. July 2, 1920. Addition to 148,943.

 166,129. Evaporating and distilling apparatus, Method of and means for preventing corrosion in. Akt.-Ges. Kummler and Matter. July 7, 1920.
- 167,464. Mechanically operated furnaces for roasting pyrites or like ores. Manufactures de Produits Chimiques du Nord
- Etablissements Kuhlmann. August 5, 1920.

 178,050. Rabble-stones for mechanical roasting and calcining furnaces. Rheinisch-Nassauische Bergwerks & Hütton Akt-Ges. W. Hocks, and G. Stohn. April 7, 1921. Addition to
- 186,693. Machines or apparatus for crushing or reducing minerals, ores and other materials. W. E. Bleloch and H. A. Stockman.
- July 1, 1921.

 186,738. Desulphurising petroleum and similar oil. W. R. Walkey and A. F. Bargate. July 18, 1921.

 186,742. Fuel, Total gasification of. Woodall, Duckham and Jones (1920), Ltd., Sir A. M. Duckham, and A. T. Kent. July 20, 1921.

- July 20, 1921.

 186,760. Flotation processes for concentrating ores and the like.
 A. C. Vivian. August 5, 1921.

 186,840. Hydrogen peroxide, Production of. Woodlands, Ltd.
 (Dr. J. Patek.) October 12, 1921.

 186,849. Stills, Settings for—and for similar purposes. P. Mather.
 November 1, 1921.

 186,855. Clay, Treatment of. W. Feldenheimer and W. W.
 Plowman. November 21, 1921. Addition to 184,271.

 186,859. \$\mathbe{\textit{2}}\$-thionaphthisatin, Manufacture of. O. Y. Imray.
 (Society of Chemical Industry in Basle.) December 1, 1921.

 186,871. Hydrogen peroxide, Method for producing solutions containing. Deutsche-Gold und Silber Scheideanstalt vorm.
 Roessler and O. Lievknecht. February 16, 1922.

 186,878. New intermediates for the production of colouring matters, Manufacture of. British Dyestuffs Corporation, Ltd.,
 A. G. Green, K. H. Saunders and E. B. Adams. August 30, A. G. Green, K. H. Saunders and E. B. Adams. August 30,
- 1921. 1921.
 635. Chromium compounds of azo dyestuffs, Manufacture of. Society of Chemical Industry in Basle and F. Straub. March 18, 1921. Addition to 104,045.
 642. Extraction of oils fats, waxes, and the like, Method of 186,635.
- and plant or apparatus for. J. A. Reavell and Kestner Evaporator and Engineering Co., Ltd. April 1, 1921.
- Applications for Patents
 Accioly, F. de M. Apparatus for treatment of mineral oil. 28438. October 19.
- Badische Anilin & Soda Fabrik, and Johnson, J. Y. Treatment of cellulose esters for dyeing. 28691. October 21.
- Brewster, T. J. Recovering and concentrating acetic acid from pyroligneous acid. 28093. October 16. (United States,
- pyroligneous acid. 28093. October 16. (United States, October 19, 1921.)
 Carpenter, C. C., and South Metropolitan Gas Co. Purification of coal gas. 28605. October 20.
 Chemical Research Syndicate, Ltd., and Marks, E. C. R. Conversion of aromatic ring compounds into motor spirits. 28225. October 17
- Clavel, R. Treatment of cellulose derivatives. 28457. October 19. (France, October 27, 1921.)

 Consortium für Elektrochemische Industrie Ges. resins from aldehydes. 28505. October 19. (Germany, October 20, 1921.)

 Danner, W. E. Emulsified liquid petrolatum, and method of
- preparing same. 28134. October 17.
 Neath, E. Manufacture of gas from coal and oil. 28459. October
- 19.
 Plauson, H., and Plauson's (Parent Co.), Ltd. Process for production of paper from peat. 28327. October 18.
 Plauson, H., and Plauson's (Parent Co.), Ltd. Process for cracking oils and simultaneous refining thereof. 28328. October 18.
- Scholefield, E., and Yorkshire Dyeware and Chemical Co.
- facture and use of a colloidal substance for dyeing and scouring animal fibres, etc. 27984. October 16.
 Scottish Dyes, Ltd. Dye-stuffs. 28596. October 20.
 Technical Research Works, Ltd., and Lush, E. J. Method of activating and re-activating metallic catalysts. 28600. October 20.
- Torrance, J. R. Mills for reducing paints and pigments. 28243.
- October 17.
 Williams, J. G. Process for manufacture of salts derivable pyrogenously from metallic ortho-phosphates. 28381. October 18.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL ACE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

LONDON, OCTOBER 26, 1922.

A FAIR volume of business is reported during the past week, and the consumptive demand is fairly well maintained. The export market is brighter, but patchy

General Chemicals

ACETONE is in active demand and higher prices are expected in sympathy with the advance in the raw material.

TIC ACID.—A substantial business is passing and prices

continue to move upwards.

ACID CITRIC is a weak market owing to the slackness in

ACID FORMIC is distinctly firmer, the demand is well maintained, and the upward tendency continues.

ACID Lactic is unchanged.

ACID TARTARIC is a slow market, and the price seems to have touched bottom for the time being.

BARIUM CHLORIDE is a rather slow market, but the demand

remains firm, and manufacturers appear to have sold very freely over the first half of next year.

COPPER SULPHATE remains unchanged. Cream of Tartar is decidedly firm in price and the second-hand parcels which have disturbed the market are apparently disappearing.

FORMALDEHYDE is in better demand and the price is well maintained

IRON SULPHATE is slow of sale.

LEAD ACETATE.—A better business is passing and the article tends to improve in value.

LEAD NITRATE is unchanged LITHOPONE is in fair demand at recent values.

Potassium Carbonate and Potassium Caustic.—Sagging and inclined to drop in value.

SODA ACETATE.—Supplies are eagerly competed for and makers are well sold for a long distance ahead.

SODIUM HYPOSULPHITE is a fairly active market, price

unchanged.

Sodium Prussiate, Yellow.—Makers are well sold over the first half of next year. Price seems likely to advance.

Sodium Sulphide is in good demand and price is slightly

easier. ZINC OXIDE has advanced in price and supplies of the higher

grades are scarce Coal Tar Intermediates

Business has been slightly more interesting during the past week, but no general broadening is to be expected under present conditions.

ALPHA NAPHTHOL has been a small home trade at recent

Alpha Naphthylamine is quiet and easy.
Aniline Oil is firm, and a fair business is passing.

Benzidine Base is a regular home trade business

BETA NAPHTHOL has been in demand, and spot parcels of good quality seem to be few

DIANISIDINE is in demand on home account, with supplies

DIMETHYLANILINE has been inquired for.

DIPHENYLAMINE is very firm with some home business offered.

"G" SALT is quietly steady.
"H" ACID is firm, and has been moderately interesting.
МЕТАРНЕНУLЕНЕDIAMINE.—Some export inquiry.

NAPHTHIONIC ACID is without change in value.

NITROBENZOL is unchanged with moderate inquiry. PARAPHENYLENEDIAMINE is in demand and price is firm.

XYLIDINE is without special feature.

Coal Tar Products

The market in coal tar products maintains a steady tone, and the demand for most products is on the whole good.

90's Benzol seems to be fairly firm at 1s. 9d. per gallon on rails in the North, and 1s. 11d. to 2s. per gallon in London.

PURE BENZOL has little inquiry, and is worth about 2s. 2d.

per gallon in the North, and 2s. 4d. per gallon in the South.

CREOSOTE OIL.—The demand is steady, and to-day's prices are 6d. per gallon in the North, and 7d. per gallon in London at works.

CRESYLIC ACID has little fresh business doing, and is steady at about 2s. 4d. per gallon on rails for the pale quality, 97/99%, while the dark is worth about 2s. to 2s. 2d. per

gallon.

Solvent Naphtha is irregular, and is quoted at is. 9d. to is. iod. per gallon on rails in the North, and 2s. per gallon in London.

HEAVY NAPHTHA is in poor demand, and is worth about

18. 7d. per gallon on rails.
NAPHTHALENE has a better inquiry for crude qualities. lower grades are worth about £5 per ton, while whizzed and hot-pressed naphthalene are worth about 46 Ios. per ton.

PITCH.—The market remains very firm, and there is still a good demand, both for prompt and forward delivery. To-day's quotations are 115s. fo.b., London, 112s. 6d. f.o.b., east coast, and 110s. f.o.b., west coast.

Sulphate of Ammonia

The position is unchanged. The demand for export is satisfactory, and prices are maintained.

Current Prices

Chemicals

70			9					
Per	£	5.	d.		· £	S.	d.	
Acetic anhydridelb.	0	1	8	to	0	I	IO	
Acetone oilton	80	0	0	to	82	IO	0	
Acetone, pureton	122	0	0	to	125	0	0	
Acid, Acetic, glacial, 99-100%ton		0	0	to	68	0	0	
Acetic, 80% pureton		0	0	to	44	0	0	
Arsenic, liquid, 2000 s.gton	67	0	0	to	70	0	0	
Boric, crystton	00	Q	0	to	05	0	0	
Carbolic, cryst. 39-40%lb.	0	0	61	to	0	0	61	
Citric	0	I	9	to	0	1	10	
Formic, 80%ton	57	10	0	to	58	0	0	
Gallic, purelb.	0	3	0	to	0	3	3	
Hydrofluoriclb.	0	0	71	to	0	0	81	
Lactic, 50 volton	40	0	0	to	43	0	0	
Lactic, 60 volton	43	0	0	to	44	0	0	
Nitric, 80 Twton	29	0	0	to	31	0	0	
Oxalic	0	0	77	to	0	0	8	
Phosphoric, 1.5ton	38	0	0	to	40	0	0	
Pyrogallic, cryst lb.	0	5	9	to	0	6	0	
Salicylic, Technicallb.	0	0	104	to	0	1	0	
Salicylic, B.Plb.	0	1	4	to	0	I	5	
Sulphuric, 92-93%ton	7	10	0	to	8	0	0	
Tannic, commerciallb.	0	2	3	to	0	2	9	
Tartariclb.	0	1	3	to	0	1	31	
Alum, lumpton	IO	0	0	to	10	10	0	
Alum, chrometon	27	0	0	to	28	0	0	
Alumino ferricton	9	0	0	to	9	5	0	
Aluminium, sulphate, 14-15%ton		10	0	to	11	0	0	
Aluminium, sulphate, 17–18%ton	II	10	0	to	12	0	0	
Ammonia, anhydrouslb.	0	1	8	to	0	1	-9	
Ammonia, .880ton	33	0	0	to	35	0	0	
Ammonia, .920ton	21	0	0	to	23	0	0	
Ammonia, carbonatelb.	0	0	4	to	0	0	41	
Ammonia, chlorideton		0	0	to	65	0	0	
Ammonia, muriate (galvanisers)ton	35	0	0	to	37	10	0	
Ammonia, nitrate (pure)ton		0	0	to	40	0	0	
Ammonia, phosphateton	68	0	0	to	70	0	0	
Ammonia, sulphocyanidelb.	0	1	10	to	0	2	0	
Amyl acetateton	175	0	0	to	185	0	0	
Arsenic, white, powderedton	49	0	0	to	51	0	0	
Barium, carbonate, 92-94%ton		0	0	to	16	0	0	
Barium Chlorida	05	0	-		70	0	0	
Barium Chlorideton			0	to	20	0	0	
Nitrateton		10	0	to	30	0	0	
Sulphate, blanc fixe, dryton		10	0	to	21	0	0	
Sulphate, blanc fixe, pulpton	10	5	0	to	10	10	0	
Sulphocyanide, 95%lb.	0	1	0	to	0	1	3	

Per	£	S.	d.		£	S.	d.	
Bleaching powder, 35-37%ton	12	0	0	to		_		
Borax crystalston Caffeinlb.	29	13	6	to	33	0	6	
Calcium acetate, Brownton	10	10	0	to	11	10	0	
" " Greyton	15	10	0	to	16	0	0	
Calcium Carbideton	16	0	0	to	17	0	0	
Carbon bisulphideton	50	0	0	to	52	-	0	
Casein technicalton	47	0	0	to	55	0	0	
Cerium oxalatelb.	0	4	6	to	0	4	9	
Chromium acetatelb. Cobalt acetatelb.	0	6	0	to	0	6	3	
Oxide, blacklb	0	9	6	to	0	IO	0	
Copper chloridelb.	0	I	2	to	0	1	3	
Sulphateton	20	0	0	to	102	0	0	
Epsom salts (see Magnesium sulphate)				•0		-	•	
Formaldehyde, 40% volton	74	0	0	to	76	0	0	
Formusol (Rongalite)lb.	0	2	6	to	0	2	9	
Glauber salts, commercialton	5	0	0	to	5	10	0	
	65	0	0	to	67	10	6	
Hydrogen peroxide, 12 volsgal.	0	2	5	to	0	2	6	
Iron perchlorideton Iron sulphate (Copperas)ton	30	0	0	to	32	5	0	
Lead acetate, whiteton	41	0	0	to	42	0	0	
Carbonate (White Lead)ton		0	0	to	47	0	0	
Nitrateton		10	0	to	45	0	0	
Lithargeton	35	10	0	to	36	0	0	
Magnesium chlorideton	7	0	0	to	7	10	0	
Carbonate, light	2	10	0	to	2	15	0	
Sulphate (Epsom salts com- mercial)ton	8	0	0	to	8	10	0	
Sulphate (Druggists')ton	11	0	0	to	11	10	0	
Manganese Borate, commercialton	65	0	0	to	75	0	0	
Sulphateton Methyl acetoneton	70	0	0	to	75	0	0	
Alcohol, 1% acetoneton		10	0	to	75	0	0	
Nickel sulphate, single saltton	49	0	0	to	51	0	0	
Ammonium sulphate, double saltton		0	0	to	52	0	0	
Potash, Causticton		0	0	to	33	0	0	
Potassium bichromatelb.	0	0	61	to		_		
Carbonate, 90%ton Chloride, 80%ton	31	0	0	to	33	10	0	
Chloratelb.	0	0	41	to	0	0	5	
Metabisulphite, 50-52%ton		0	0	to	90	0	0	
Nitrate, refinedton	43	0	81	to	45	0	0	
Permanganatelb. Prussiate, redlb.	0	4	6	to	0	4	9	
Prussiate, yellowlb.	0	I	7	to	0	I	8	
Sulphate, 90%ton Salammoniac, firstscwt.	3	3	0	to	13	10	0	
Secondscwt.	3	0	0	to		_		
Sodium acetateton	24	10	0	to		15	0	
Arseniate, 45%ton Bicarbonateton	45	10	0	to	48	0	0	
Bichromateib.	0	0	51	4		_		
Bisulphite 60-62%ton	23	0	0	to	24	0	0	
Chloratelb.	20	O	31	to	21	0	4	
Caustic 76%ton	21	10	0	to	22	10	0	
Hydrosulphite, powder, 85%Ib.	0	I	9	to	0	2	0	
Hyposulphite, commercial ton Nitrite, 96–98%ton	12	0	0	to		10	0	
Phosphate, crystalton	16	10	0	to	30	0	0	
Perboratelb.	0	0	II	to	0	x	0	
Prussiatelb. Sulphide, crystalston	0	0	114	to	12	I	0	
Sulphide, solid, 60–62%ton	20		0	to	22	10	0	
Sulphite, crystton	12	10	0	to	13	0	0	
Strontium carbonateton		0	0	to	60	0	0	
Strontium Sulphate, whiteton	43	10	0	to	45	10	0	
Sulphur chlorideton		0	0	to	27	10	0	
Sulphur, Flowerston	II	0	0	to	12	0	0	
Rollton Tartar emeticlb.	0	0	0	to	12	0	5	
Theobrominelb.	0	12	6	to	0	13	0	
Tin perchloride, 33%lb.	0	I	2	to	0	I	4	
Perchloride, solid	0	I	5	to	0	I	7	
Zinc chloride 102° Twton Chloride, 2010, 96–98%ton	21	0	5	to	22	10	0	
Chloride, solid, 96–98%ton	25	. 0	0	to	30	.0	0	
Oxide, 99%ton Dust, 90%ton		0	0	to	38	10	0	
Sulphateton			0	to	17		0	

	Coar rai interincu	att	53,	ac.				
	Per	£	S.			£	S.	d.
	Alphanaphthol, crudelb.	0	2	3	to	0	2	6
	Alphanaphthol, refinedlb.	0	3	0	to	0	3	3
	Alphanaphthylaminelb.	0	2	0	to	0	2	I
	Aniline oil, drums extralb.	0	I	0	to	0	I	1
	Aniline saltslb.	0	I	0	to	0	I	I
	Anthracene, 40-50%unit	0	0	81	to	0	0	9
1	Benzaldehyde (free of chlorine)lb.	0	3	6	to	0	4	ó
1	Benzidine, baselb.	0	5	3	to	0	5	6
1	Benzidine, sulphatelb.	0	5	3	to	0	5	6
1	Benzoic acidlb.	0	1	9	to	0	2	0
	Benzoate of sodalb.	0	I		to	0	2	0
-	Benzyl chloride, technicallb.	0	2	9	to	0	2	
	Betanaphthol benzoatelb.	0	5	0	to	0		3
	Betanaphthollb.	0	1	4	to	0	5	41
-	Betanaphthylamine, technicallb.				to			6
1	Crossing Asid res 0/ basis	0	5	0		0	5	
1	Croceine Acid, 100% basislb.	0	3	6	to	0	3	9
	Dichlorbenzollb.	0	0	9	to	0	0	10
	Diethylanilinelb.	0	2	9	to	0	3	0
	Dinitrobenzolb.	0	I	3	to	0	I	4
	Dinitrochlorbenzollb.	0	0	II	to	0	1	0
1	Dinitronaphthalenelb.	0	I	4	to	0	I	5
	Dinitrotoluollb.	0	I	5	to	0	I	6
1	Dinitrophenollb.	0	X	9	to	0	2	0
1	Dimethylanilinelb.	0	2	6	to	0	2	9
	Diphenylaminelb.	0	4	3	to	0	4	6
]	H-Acidlb.	0	- 6	3	to	0	6	9
-1	Metaphenylenediaminelb.	0	4	9	to	0	5	3
1	Monochlorbenzol	0	0	10	to	0	I	0
	Metanilic Acidlb.	0	6	0	to	0	6	61
1	Metatoluylenediaminelb.	0	4	6	to	0	4	9
	Monosulphonic Acid (2.7)lb.	0	5	6	to	0	6	0
1	Naphthionic acid, crudelb.	0	3	0	to	0	-	
1	Nanhthianata of Code	_					3	3
1	Naphthionate of Sodalb. Naphthylamin-di-sulphonic-acidlb	0	3	0	to	0	3	3
í	Neville Winther Acidlb.	0	7	9	to	0	8	3
	Nitrobenzollb.	0	0	9	to	0	0	91
	Nitronaphthalenelb.							-
		0	I	3	to	0	1	4
	Nitrotoluollb.	0	I	0	to	0	I	2
	Orthoamidophenol, baselb.	0	12	0	to	0	12	6
3	Orthodichlorbenzollb.	0	1	0	to	0	I	I
	Orthotoluidinelb.	0	I	6	to	0	I	9
	Orthonitrotoluollb.	0	0	8	to	0	0	10
J	Para-amidophenol, baselb.	0	9	0	to	0	9	6
1	Para-amidophenol, hydrochlorlb.	0	8	6	to	0	9	0
	Paradichlorbenzollb.	0	0	.6	to	0	0	7
	Paranitranilinelb.	0	3	6	to	0	3	9
1	Paranitrophenollb.	0	2	3	to	0	2	6
]	Paranitrotoluollb.	0	5	0	to	0	5	3
	Paraphenylenediamine, distilled lb.	0	10	6	to	0	10	9
1	Paratoluidinelb.	0	6	0	to	0	6	6
1	Phthalic anhydridelb.	0	2	9	to	0	3	0
1	Resorcin, technicallb.	0	4	6	to	0	5	0
	Resorcin, purelb.	0	6	3	to	0	6	6
	Salollb.	0	2	0	to	0	2	
	Sulphanilic acid, crudelb.	0	I	0	to	0	1	3
7	Folidine, baselb.	0	6	6	to	0	7	0
	Tolidine, mixturelb.	0	2	6	to	0	2	9
	,	-	_	-	-	-	-	7

Coal Tar Intermediates, &c.

Institution of Chemical Engineers Articles and Bye-Laws Approved

At the fourteenth meeting of the Provisional Committee of the Institution of Chemical Engineers, held on Wednesday, October 18, at 166, Piccadilly, London, the hon. treasurer submitted a statement of account to date showing a balance to the credit of the Institution of £69 8s. 10d. It was the opinion of the committee that this sum was not sufficient to meet current expenses, and that it was undesirable to call for a further contribution from the donors at the moment. The position was solved by Mr. P. A. Greene generously handing over his cheque for £50, being the balance of the amount of his donation of £100 towards the initial expenses of the Institution. A hearty vote of thanks was extended to Mr. Greene for his generous act. After discussion with reference to subscriptions, letters were read from the solicitors relating to amendments of the constitution suggested by the Board of Trade. These amendments were accepted, and the memorandum, articles of association and by-laws as drafted and amended approved.

approved.

It was agreed that in future meetings of the provisional committee should be held on the third Wednesday in every

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

GLASGOW, OCTOBER 25, 1922.

THERE has been little or no change in the chemical market during the past week, the amount of business booked being still very moderate.

Prices generally are steady, one exception being acetone, which is becoming very scarce.

Industrial Chemicals

ACETONE.—Some spot parcels offered at £115 to £120 per ton ex wharf London.

ACID ACETIC.—98/100% glacial. About £59 to £63 per ton, ex wharf; 80% technical, £40 to £42 per ton; 80% pure, £44 to £45 per ton.

ACID BORACIC.—Prices unchanged; crystal or granulated,

£60 per ton; powdered, £62 per ton delivered.
ACID CARBOLIC.—Ice crystals quoted 6½d. per lb.
ACID FORMIC 85%.—In moderate demand. On offer at
£57 10s. per ton.

ACID HYDROCHLORIC.—Makers' prices unchanged at 6s. 6d. per carboy, ex works.

ACID NITRIC.—80° Tw. quoted £25 10s.; 84° Tw. £27 10s.

per ton, ex station.

ACID OXALIC.—Spot lots on offer at 7d. per lb.

ACID SULPHURIC.—Makers' price unchanged; 144°, £4 per ton; 168°, £7 5s. per ton, ex works; de-arsenicated,

ton; 108°, £7 5s. per ton, ex works; de-arsenicated, £1 per ton more.

ACID TARTARIC.—Moderate inquiry. Price 1s. 3½d. per lb.

ALUM, LUMP POTASH.—Offered at £14, ex store, spot delivery.

ALUMINA SULPHATE, 14/15%.—Offered from Continent at £8 1os. per ton, c.i.f.; 17/18%, £1o 1os. per ton c.i.f.

AMMONIA ANHYDROUS.—In little demand. Price 1s. 8d.

per lb., ex works.

Ammonia Carbonate.—Unchanged; lump, 4d. per lb.;

ground, 4\d. per lb., delivered.

Ammonia Liquid.—880°, about 3\frac{1}{2}d. per lb.; 940°, 1\frac{3}{2}d.

per lb., ex works.

Ammonia Muriate.—Grey galvanisers quality, £32 per ton, f.o.r. works. Continental material, £26 10s. per ton, c.i.f. U.K.

Ammonia Sulphate.—25¼%, £14 15s. per ton; 25¾% neutral quality, £15 18s. per ton, ex works.

Arsenic, White Powdered.—In fair demand. Price now

£51 per ton, ex quay.

BARIUM CARBONATE, 98/100%.—Continental material, £14
per ton, c.i.f. U.K.
BARIUM CHLORIDE.—English make about £20 per ton, ex
works. Continental about £19 per ton, c.i.f. U.K.

BARYTES,-Finest white English, £5 5s. per ton, ex works. BLEACHING POWDER .- Unchanged at £12 15s. per ton, ex

station, spot.

Borax.—Crystal or granulated, £29 per ton; powdered, £30 per ton, delivered.

CALCIUM CHLORIDE.—English makers' price, £6 per ton, ex quay. On offer from Continent at £4 5s. per ton, c.i.f. U.K.

COPPER SULPHATE .- In little request, £26 per ton, f.o.b. for export.

COPPERAS, GREEN.—Quoted £3 15s. per ton, ex works in full loads.

FORMALDEHYDE, 40%.—On offer at £69 to £70 per ton, ex wharf, spot delivery.

GLAUBER SALTS.—Price £4 to £4 10s. per ton, ex store.

Lead.—English material—red, £37 15s. per ton; white, £49 15s. per ton, ex station. Continental material about £35 per ton, on spot.

Lead Nitrate.—Price about £44 to £45 per ton.

MAGNESITE, GROUND CALCINED .- £7 to £10 per ton, according

to quality.

MAGNESIUM CHLORIDE.—Spot lots about £5 15s. per ton.

Offered from Continent at £4 per ton c.i.f.

MAGNESIUM SULPHATE (EPSOM SALTS).—Prices unchanged;

commercial, £7 5s.; B.P., £9 per ton.

Potassium Bichromate.—Makers' price, 64d. per lb. delivered.

Potassium Carbonate, 90/92%.—In fair demand, £28 10s. per ton, ex store.

POTASSIUM CAUSTIC, 88/92%.—Price about £28 per ton, c.i.f. U.K.

POTASSIUM CHLORATE.—Unchanged at about 41d. per lb.

POTASSIUM NITRATE (SALTPETRE).-Quoted £32 per ton, ex store, spot delivery.

POTASSIUM PERMANGANATE.--In moderate demand. Price for commercial crystals, 73d. per lb.

POTASSIUM PRUSSIATE (YELLOW).—Offered at 1s. 61d. per lb.

ex station. SODIUM BICARBONATE.—Refined quality, flo 10s. per ton, ex quay or station; m.w. quality, fl per ton less.

SODIUM BICHROMATE.—Makers' price unchanged at 5d. per

lb., delivered.

Sodium Carronate.—Soda crystals, £5 ios. to £5 i5s. per ton, ex quay or station; alkali, 58%, £8 i6s. 6d. per ton, ex station, minimum 5 ton lots.

Sodium Caustic, 76 77%, £23 5s. per ton; 70/72%, £21 5s. per ton; 60/62%, £20 5s. per ton; 98/99%, powdered, fig. 15s. to £27 15s. per ton, ex station; bottoms, £11 per ton, ex store.

Sodium Hyposulphite.—Commercial about £12 per ton, ex store; pea crystals, £18, ex store.

Sodium Nitrate.—Refined quality, 96/98%, about £12 58.

per ton, free on rails.

SODIUM PRUSSIATE.—Yellow offered at IIId. per lb., ex store. SODIUM SILICATE, 140°.—English make, £12 5s. per ton, ex station.

SODIUM SULPHATE (SALTCAKE 95%).—Price unchanged at £4 per ton delivered.

Sodium Sulphide, 60/62% Conc.—Continental offers of £15 per ton, c.i.f. U.K.; 30/32% crystals offered at £8 per ton, c.i.f. U.K.

SULPHUR.—Government surplus stocks of Sicilian thirds still available at £3 15s. per ton, ex depot; flowers, £12 per ton; roll, £11 per ton; rock, £10 per ton; ground, £10 per ton; prices normal.

TIN CRYSTALS,-Moderate inquiry for export 1s. 2d. per lb.

ZINC SULPHATE. - Offered at £11 per ton c.i.f.

Coal Tar Intermediates and Wood Distillation Products

Benzol.—Considerable quantities are being put on the market, and prices tend to be lower.

Betanaphthol R.—Home inquiry. Offered at is. 4d. to

rs. 5d. per lb., according to quality, carriage paid

DIMETHYLANILINE.—Export inquiry. Price 2s. 7d. per lb. f.o.b., drums included. ORTHOTOLUIDINE.—Supplies are offered at is. 4d. to is. 6d.

per lb., carraige paid, returnable drums. PARA AMIDO ACETANILIDE.—Home inquiry. Price 6s. per

lb., carriage paid. PARANITRANILINE.—Home trade inquiries. Price 3s. per lb.,

carriage paid, casks included.

Paraphenylenediamine Base.—Home inquiry. Price 13s. per lb., 100% basis, carriage paid.

PHTHALIC ANHYDRIDE.—Home inquiry. Price quoted 2s. 6d. per lb., delivered.

PICRIC ACID.—Export inquiry. Price quoted is. per lb., f.o.b.
"R" SALT.—Home inquiry. Price quoted 3s. per lb., 100% basis, carriage paid.

Distillers and Yeast Negotiations

THE DISTILLERS Co., LTD., announce that there is no truth in a rumour that negotiations had been concluded for the yeast portion of the company's business to American interests. It is pointed out that Mr. W. H. Ross, the managing director, at the annual meeting held in July last, indicated that certain proposals had been made to the company, but that no definite offer had beer received then. Conversations had been, and still are, proceeding, but no decision has yet been arrived at.

The Manchester Chemical Market

[FROM OUR OWN CORRESPONDENT.]

Manchester, October 26, 1922.

The chemical trade here is remarkable at the moment for the tone of quiet confidence which pervades most sections. Particularly is this the case with regard to some of the staple lines, the home demand for which is better than it has been for a long time. The iron and steel and paper-making industries are calling for regular deliveries, and with some of the other consuming trades taking fair quantities, the market is as cheerful as one may reasonably expect it to be in view of the general situation. Prices all round hold firm, and the opinion is again expressed that, speaking generally, they have about touched bottom.

An increased foreign inquiry is reported in some quarters, but up to the present not much increase in actual business has occurred, buying operations being practically restricted to Colonial markets.

Heavy Chemicals

Caustic soda is being readily absorbed by home trade users and for export also there continues to be a fairly regular demand; home consumption prices vary from £20 5s. per ton for 60 per cent. to £23 5s. for 76 per cent. strength. Bleaching powder is unchanged at £12 to £12 1os. per ton, in softwood casks, and sellers meet with a moderate demand both for home and export. Saltcake is improving a little, a better inquiry having been met with; the price keeps at £4 per ton. Sodium sulphide is rather quiet at £18 for 60–65 per cent. concentrated and £13 per ton for crystals. There is no change in the position of bicarbonate of soda, which is offered at £10 1os. per ton, in 2-cwt. bags. Soda crystals are rather a better market at £5 12s. 6d. per ton delivered. Ammonia alkali, 58 per cent. material, is maintained at £7 17s. 6d. per ton, in bags, for home delivery; but the demand is still on the quiet side. Hyposulphite of soda is in steady demand at £18 for photographic crystals, and £10 1os. per ton for commercial. Nitrite of soda keeps fairly active at £28 1os. per ton, though foreign makes are offering at lower prices. Glauber salts are a quiet section at £4 1os. per ton. Chlorate of soda is selling more readily, and 3d. per lb. is still asked. Not much business is passing in acetate of soda, which is quoted at about £23s. Ios. per ton. Prussiate of soda continues in steady demand, but supplies are short, and the price is unchanged at 11½d. per lb. Phosphate of soda is quoted at £16 per ton, but there is not a big inquiry for this product.

Caustic potash is active, and the price very firm at £29 per ton for 88-90 per cent. strength. Carbonate of potash is still quiet at £29 per ton for 96-98 per cent. material. Prussiate of potash is scarce, and firm at 1s. 6d. per lb. for yellow and 4s. for red. Bichromate of potash meets with a steady inquiry, and prices are firm at 6¼d. to 6¼d. per lb. Chlorate of potash is in better demand at 4d. per lb. Permanganate of potash

for red. Bichromate of potash meets with a steady inquiry, and prices are firm at 6\frac{1}{2}\text{d}. to 6\frac{1}{2}\text{d}. per lb. Chlorate of potash is in better demand at 4d. per lb. Permanganate of potash is quiet and unchanged at 7\frac{1}{2}\text{d}. to 7\frac{1}{2}\text{d}. per lb.

There is no change in the position of sulphate of copper, the home demand being still lifeless; \(\frac{1}{2}\text{d} \) to \(\frac{1}{2}\text{d} \) per ton is quoted. Spot supplies of arsenic are scarce, and with a steady demand white powdered, Cornish makes, is quoted at up to \(\frac{1}{2}\text{d} \) per ton. Commercial epsom salts are quiet at \(\frac{1}{2}\text{d} \) 5s. per ton. Acetate of lime is firmer at \(\frac{1}{2}\text{J} \) 5 ios. for grey and \(\frac{1}{2}\text{8} \) per ton and brown. White sugar of lead is unchanged at \(\frac{1}{2}\text{8} \) per ton and brown \(\frac{1}{2}\text{4}, \) without any notable expansion in the demand. Nitrate of lead is now easier at about \(\frac{1}{2}\text{4} \) per ton. Ammonium muriate is in moderate inquiry, and price steady at \(\frac{1}{2}\text{5} \) for grey and \(\frac{1}{2}\text{0} \) per ton for white. Lump alum is inactive at last week's level of \(\frac{1}{2}\text{3} \) per ton. Formaldehyde is firm at about \(\frac{1}{2}\text{0} \) per ton.

Acids and Tar Products

Tartaric and citric acids are still quiet sections, though there is no change in prices; tartaric is quoted at 1s. 3d. and citric 2s. per lb. for B.P. quality. Acetic acid is in good demand at £65 for glacial and £40 per ton for 80 per cent. technical. Oxalic acid is quoted at 7d. per lb., but little business is being done. Crystallised boracic acid is on offer at £60 per ton.

Pitch has apparently not yet touched the top, £4 17s. 6d. per ton now being asked here; carbolic acid crystals are quiet but firm at 6½d, per lb. Crude carbolic acid keeps in short supply at 2s. to 2s. 3d. per gal. for 6o per cent, material. Solvent naphtha is in better demand, and prices firm at 1s. 1od. for 90–16o, and 1s. 6d. per gal. for 90–19o. Creosote

oil is firm at 6½d, to 6½d, per gal. Naphthalenes are unchanged from last week's levels, crude being quoted at up to £7 per ton, 'according to quality, flake about £17, and crystallised £15 per ton. The price of benzol is firmly maintained at is. iod. per gal.

Nitrate Market Position

Further Increase in German Synthetic Prices

In their report on the nitrate of soda market, under date of October 19, Aikman (London), Ltd., state that since October 5 the arrivals amount to about 18,000 tons, and about

20,000 tons are due during the next fortnight.

The market has continued quiet throughout the fortnight, with business restricted owing to the continued fluctuations in foreign exchanges. Continental dealers, however, still maintain the view that consumption next spring will be satisfactory, and that although consumers may to a greater extent than usual delay their purchases in anticipation of an improvement in their currencies in the new year, the volume of business will eventually be on a large scale. Quotations are unchanged at about IIs. 6d. to IIs. 10½d. September-November, and I2s. to I2s. 3d. per hundred weight c.i.f. December-February shipment, basis Bordeaux-Hamburg range, with extra freight for outside options.

Producers' Association Sales

The Producers' Association have sold about 20,000 tons during the fortnight, all for early shipment, making their total sales for shipment after July I about 930,000 English tons. To this quantity must be added the production of the American companies (outside the Association), say about 50,000 tons, and sales by the German companies (before they entered the Association) for July, 1922-June 1923, shipment, amounting to about 70,000 tons, so that the total quantity sold for shipment during the current nitrate year can be estimated at 1,050,000 tons.

Position of Supplies

At June 30, 1922, the visible supply for Europe, America, and other countries was about 270,000 tons, in addition to about 25,000 tons recently sold by the American Government (ex their reserve stock of 175,000 tons). The total supply so far provided for the current nitrate year's consumption, and stocks at the end of the season, thus amounts to a total of 1,345,000 tons. Of this quantity it is estimated that about 600,000 tons appertain to the United States, 650,000 tons to Europe, and 95,000 tons to Japan and other countries. The deliveries for the year ended June 30, 1922, for these countries were 565,000, 895,000, and 84,000 tons respectively, from which it is evident that considerable further quantities are unlikely to be bought from the association before February-March shipment, those already bought being amply sufficient to meet the consumption in the first part of the season.

German Stocks

A further increase in price in German synthetic nitrogen products took place early this month, nitrate of soda being raised from 292m. to 359.30m., sulphate of ammonia from 242.20m. to 297.90m., and cyanamide from 215.60m. to 265.10m., all per unit of nitrogen per 100 kilos. The stocks in factories at October 1 were reported exhausted, so that German consumers will be dependent on new production for their next spring's consumption. According to the German Press, a Bill is before the Reichstag to empower the Government to compensate agriculturists for a portion of the value of their crops by supplying them with Chilean nitrate of soda.

The production figures for September were cabled as 100,000 tons, against 67,000 in 1921, 204,000 in 1920, and 205,000 in 1913. Stocks in Chile, September 30, were 1,495,000 tons, against 1,439,000 in 1921, 1,303,000 in 1920, and 752,000 in 1913.

1913. Stocks in Chile, September 30, were 1,495,000 tons, against 1,439,000 in 1921, 1,303,000 in 1920, and 752,000 in 1913. The shipment figures for the first half of October are as follows: To Europe and Egypt, 36,000 tons, against 20,000 in 1921, 63,000 in 1920, and 122,000 in 1913; to United States, 45,000 tons, against 33,000 in 1920, and 24,000 in 1913; to Japan and other countries, 6,000 tons, against 6,000 in 1921.

Freights have ruled steady with several tramp steamers, November-December shipment, reported fixed for Europe at 32s. 6d. to 31s., and shipment by liner at 31s. November-December, and at 29s. 6d. to 30s. per ton for January-February shipment. For the United States a considerable number of October-November shipment steamers were reported fixed at the equivalent of 24s. 6d. to 26s. per ton.

Consulting Chemist's Discharge from Bankruptcy

The affairs of Mr. Leon Maurice Hirchberg, consulting chemist, Ely Place, London, who was adjudged a bankrupt on May 9 last, came before Mr. Registrar Francke at the London Bankruptcy Court on Friday last week on the hearing of his application for an order of discharge. In reading his report on the application the Official Receiver said that in his opinion the total unsecured indebtedness amounted to £2,072, in respect of which proofs of debt amounting to £1,862 had been lodged and admitted to rank against the estate. The assets, which were estimated by the debtor to realise $f_{3,117}$, had produced only f_{116} , and a dividend of 6d. in the f_{3} was likely to be paid. The debtor was a German subject who came to this country in 1912, and had not been naturalised. Until 1914 he was in employment, latterly as a chemist, and was afterwards engaged until November, 1918, in the manufacture of munitions for the British Government, receiving special protection. In January, 1919, he began business as a consulting chemist at 85, London Wall, E.C., and in the following June was joined in partnership by another person, who introduced £500 into the business In September, 1920, however, the partnership was dissolved and the debtor continued the business until December last when he closed it, and he had since been without regular occupation and dependent on friends. He attributed his insolvency to slump in trade and to heavy expenses in connection with his wife's illness. He became aware of his insolvency in October, 1921, when he practically ceased to transact any business, although he carried on for three months and contracted certain debts which he said he hoped to repay out of the salary that he would receive from an anticipated appointment as consulting chemist to a company which had, however, not been formed. The only offences reported by the Official Receiver were the insufficiency of the debtor's assets to pay ros. in the $\underline{\ell}$ to the unsecured creditors, and that the debtor had omitted to keep proper books of account.

His Honour granted the debtor an immediate discharge subject to his consenting to judgment being entered up

against him for £200.

Bankruptcy of a Chemical Merchant

Under a receiving order recently made against the estate of Mr. Robert Haslam Jackson, 3, Essex Court, Temple, London, the statutory first meeting of creditors was held on October 18 at Bankruptcy Buildings, Carey Street, London, the Official Receiver presiding. It appeared that the debtor had occasionally traded as a merchant in chemicals, etc., at 19, Devereux Court, Strand, and in June last the business, which was styled the Philides Production Co., was converted into a limited company, with a nominal capital of £1,000. He provided no capital, but acted as a director of the company, in which he received 100 £1 shares. In August last, however, he resigned his position. In June, 1920, the debtor became surety for another person in the sum of £300, which he was called on to pay in the following October. The sum was paid into court the same month under a writ which was issued. Litigation had since been proceeding with reference to the suretyship. The debtor attributed his failure to lack of capital, caused, as he alleged, by the litigation into which he had been forced. He estimated his liabilities at £2,500, while his assets consisted of a reversionary interest in certain property. The meeting passed a resolution for bankruptcy, and the matter remained in the hands of the Official Receiver.

Affairs of a Chemical Director

MR. JOHN HENRY ROBINSON HEX, company director, of 12, Regent Square, London, W.C., who had been interested in Shepperley's Manufacturing Chemists, Ltd., and British Pharmacies, Ltd., and his creditors met by adjournment at Bankruptcy Buildings, Carey Street, London, on October 19. The debtor's statement of affairs showed liabilities £552 and estimated assets £2,520. The meeting had been adjourned to enable the debtor to amend his proposal which he was making for the benefit of his creditors, and to enable the creditors to send in their voting letters. But it appeared that they were not desirous of entertaining the proposal and the meeting was now closed, the matter remaining in the hands of the Official Receiver.

Affairs of a Colour Merchant

MR. H. A. HUGHES, 5, Moorgate Street Buildings, London, E.C., who had been engaged in the colour trade, was publicly examined at the London Bankruptcy Court on Tuesday, on a statement of affairs showing ranking liabilities £8,374 and assets £1 128. 2d. It appeared that he had failed on a previous occasion, in June, 1914, when after having carried on business as a gum merchant he was adjudged a bankrupt in the High Court. His scheduled liabilities then amounted to £1,913, and his assets were estimated to realise £250. A dividend of 18. 2d. in the £ was paid, and he obtained his discharge in November, 1915, subject to a suspension of two years. He was employed after the failure latterly as agent for a firm of colour merchants until February, 1918. He then formed a company called H. A. Hughes, Ltd., with a nominal capital of £1,000, and he was appointed its managing director at a remuneration of £500 per annum. In March of last year, however, the company went into voluntary liquidation. He had since had the use of an office at 5, Moorgate Street Buildings, where he had carried on business as a commission agent, chiefly dealing in dry colours. The debtor attributed his insolvency to the failure of H. A. Hughes, Ltd. The company had carried on a flourishing business until it was affected by the Government restrictions during the war. The examination was concluded.

Unsuccessful Manufacture of Vermin Poison

Under a receiving order made against Mr. E. De Cesari, manufacturer of vermin killer, 9, Ampthill Square, London, N.W., on September 29, the statutory first meeting of creditors was held recently at Bankruptcy Buildings, Carey Street, W.C. The official receiver reported that in 1900 the debtor, with practically no capital, began business as a manufacturer of vermin killer under the style of E. de Cesari and Co., in Gresse Street, Rathbone Place, W. In 1913 he was joined in partnership by another person, and they continued the business under the style of the Vermin Killer Co., at 15, Bersey Street. The debtor attributed his failure to the action of the landlord in proceeding against him for damages for breach of covenant under the lease. With reference to his liabilities he said that there was £1,400 owing to the petitioning creditor, while his assets, apart from his interest in the partnership, were worth £20. There was no offer of composition before the meeting, and it appeared that the Court had already made an order adjudging the debtor a bankrupt. The case was a summary one, and on resolution being passed, remained in the hands of the official receiver as trustee.

Manufacturing Chemists' Failure

In the compulsory liquidation of Acte and Co., Ltd., manufacturing chemists, 70, Newman Street, London, W., the official receiver has now issued to the creditors and to the contributories a summary of the statement of affairs showing liabilities £26,869, of which £21,647 are returned as expected to rank, and estimated assets £5,217, the whole of which are absorbed in part payment of loans on debenture bonds. A deficiency of £21,647 is thus disclosed with regard to the creditors, while in relation to the contributories a total deficiency of £24,508 is shown. The official receiver reports that the company was incorporated in August, 1910, with a nominal capital of £4,000 in shares of £1, and the issued capital at the date of the winding-up order was £2,861, the whole of which was issued for cash and paid up.

An Acid Tower Fatality

The Manchester City Coroner on October 20, held an inquiry into the circumstances attending the death of a labourer named Fred Lunt, of Gibson Street, Newton Heath, Manchester. It appears that the deceased man was engaged earlier in the week along with other men on the work of dismantling a wooden shed on an acid tower, 60 ft. in height, at a works in Holland Street, Newton Heath. According to the evidence given at the inquest, the roof had been taken off and the wind blew down one side, weakening the structure. A witness stated that another sudden gust of wind crumpled up the remainder like a piece of cardboard and the shed, with Lunt in it, was hurled from the top of the tower. The deceased fell only a distance of 16 ft. on to a gantry, but he sustained a fractured spine and died the following day. The Coroner returned a verdict of "accidental death," and described it as an accident, pure and simple.

Company News

ANGELA NITRATE Co.—An interim dividend of 5 per cent. (18. per share), less tax, is payable on November 13.

(1s. per share), less tax, is payable on November 13.
SCOTTISH OLLS, LTD.—Rumours have been current during the week to the effect that important changes are pending in the directorate of the company.

BRYANT AND MAY, LTD.—It is announced that the 5 per cent. debenture stock issue was more than six times subscribed. Allotment letters were posted on Wednesday.

Salar del Carmen Nitrate Syndicate.—On account of the profits for the current year an interim dividend of 5 per cent., less tax, is announced. Last year a similar amount was paid.

ANGLO-CHILEAN NITRATE AND RAILWAY Co.—An interim dividend on account of the year 1922 of 1s. per preference share and 1s. per ordinary share, both free of tax, being 5 per cent. on each class of shares, is payable on November 15 to holders registered on October 27.

ELECTROLYTIC ZINC Co.—According to an Exchange message from Melbourne the chairman announced on Tuesday the probability of an early dividend on the ordinary shares, which are chiefly held by the Zinc Corporation, the Amalgamated Zinc, the North Broken Hill, and South Broken Hill companies.

A. AND F. PEARS.—Including £12,788 brought in, the accounts for the year to June 30 last show an available balance of £108,000. Dividends have been paid of 6 per cent. on the preference shares, £12,000; 12 per cent. preferred ordinary, £38,400; and 20 per cent. on ordinary, £40,000; to reserve, £5,000; forward, £12,600.

UNITED ALKALI Co., LTD.—The directors have declared a half-yearly dividend of 7s. per share on the preference shares, less tax. For the two previous half-years only 4s. per share was paid on the preference shares, making the dividend 6s. per share in arrear, but in July last the directors decided to make up the deficiency, and 6s. per share, less tax, was paid on the 29th of that month.

DAY AND MARTIN, LTD.—Presiding on October 19, at the annual general meeting, Mr. C. P. Hargreaves regretted that the results were unsatisfactory, and referred to the unparalleled state of affairs which had prevailed in the home and export trade. Many improvements had been made at the Stratford factory, but in view of prevailing conditions a scheme of reconstruction would be necessary in order to provide fresh capital.

Broken Hill Proprietary Co.—The net profit for the year ended May 31, after deducting £154,244 for depreciation, amounted to £103,300. A dividend of 9d. per share, absorbing £92,054, has been paid during the period. A sum of £220,000 has been transferred from appropriation account to reserve funds, which now stand at £1,535,000. A sum of £1,068,144 was expended in plant and construction, of which £890,896 was in connection with the Newcastle Steel Works.

ERINOID, LTD.—The trading profits for the year to August 31 last were £27,935. After allowing for depreciation, etc., the net profits are £13,222. After deducting a debit of £9,719 brought in, there remains £3,503 to carry forward. During the latter six months of the company's year there has been a marked increase in sales, which still continues, and the prospects for ensuing year are considered to be most promising. The annual meeting will be held at the Institute of Chartered Accountants, Moorgate Place, London, E.C., on October 31, at noon

ZAPIGA NITRATE Co.—The report to December 31 last states that the municipal authorities in Iquique, having obtained an order to dispose of part of the company's property to defray accrued taxes, the holders of the 5 per cent. first mortgage debentures have declared their intention, for their own protection, to institute proceedings for foreclosure. As the company is without funds, and has a total indebtedness here and in Chile of £128,377, the directors feel unable to oppose. The company, which was formed in 1906, with a paid-up capital of £80,000, closed its maquina in August, 1908, and this has never been restarted. Only one dividend—5 per cent. actual for the initial period to December, 1906—has been paid, while debenture interest is in arrear from August, 1908.

BROKEN HILL SOUTH.—The report for the year ended June 30 states that pending the necessary readjustment of operating conditions at Broken Hill, the treatment of dump

slime has continued and provided a very substantial source of revenue. The net profit for the year was £235,747, after providing for taxation and depreciation. The available balance, after deducting debenture redemption allocation £13,333), new plant expenditure £62,400, and including the amount brought forward, is £167,425. Dividends Nos. 3 and 4 of 2s. per share each have been declared and represent the distribution of £160,000. A large proportion of the gross profits have been derived from the treatment of dump slime. The assets, exclusive of shares in other companies, show a surplus over liabilities of £625,984. The ore reserves are estimated at 3,500,000 tons, but a geological survey has shown that, inclusive of the southern end of the westerly ore channel which is not fully developed, an additional 1,000,000 to 2,000,000 tons of ore may be expected.

Amalgamated Zinc (de Bayays), Ltd.—The directors announce that the differences regarding contracts between this company and the Broken Hill South Co. have been amicably settled without recourse to litigation. Under the basis of settlement subsisting contracts will expire on December 30th next. Negotiations are now proceeding for the purchase or treatment by this company of tailings of the South company produced between December 31st next and the date of completion of flotation plant which that company is now constructing. The report for the half-year ended June 30th, 1922, states:—Material treated, 156,313 tons, producing 41,298 tons zinc concentrates and zinc slime concentrates; also 4,066 tons lead slime concentrates. Liquid assets show surplus over liabilities of £152,192, not including tailings paid for but untreated, nor £425,310 paid on shares in other companies, vide last balance-sheet, after adding £1,000 to amount paid up on shares of Mining and Metallurgical Processes Proprietary, Ltd. Current production tailings received during half-year, 54,870 tons. Profit on working account, after transferring £7,743 to reserve for depreciation, was £28,264, and, after taking into account profit and loss items, including £5,512 received from dividends on shares in other companies, the profit transferred to appropriation account was £26,083, from which £25,000 carried forward to next half-year, and £1,083 transferred to depreciation of property patents and processes account.

Far Eastern Sulphur Production

Dealing with the occurrence of sulphur in the Far East, Finance and Commerce, of Shanghai, states that sulphur is found in many parts of China, and also in Japan and Formosa. In Yunnan the mineral exists in its pure state in districts in the north and west of the province, as a deposit at the sources of hot springs, but owing to the lack of transport facilities and high cost of freight it is not exported. It is used locally, however, principally in the manufacture of explosives. In Hunan sulphur is produced as a by-product at the Shuikoushan mines on the upper Siang River. A considerable amount of sulphur is also produced in Hunan by the distillation of iron pyrites, principally in the districts of Pinkiang, Hsinhua, and Chenchow. In Shansi, on the Taiyuanfu plain, there are rich deposits of sulphur; while in Szechwan, Honan, Kweichow, Shantung, and Manchuria sulphur is manufactured, partly from pyritiferous shale and partly from the sulphide ores of zinc and lead. Japan, being a volcanic country, is naturally rich in sulphur deposits, but only those deposits containing not less than 40 per cent, of the mineral are worked. Sulphur is found chiefly in the Japan Sea districts of northern Japan, and in Hokkaido, on the east coast. During the war, when there was an abnormal demand for sulphur for munitions, the export from Japan increased very largely, and in 1917 it was valued at yen 6,142,793. In 1918, however, it fell to yen 3,868,375, and in 1919 it was down to yen 2,035,462. Large deposits of sulphur also exist in the northern corner of Formosa.

Recent Wills

Mr. Edward James Thatcher, of the Manor House, Chew Magna, Somerset, oil and colour merchant and drysalter

Dr. William Kellner, F.I.C., of Old Charlton. Kent, formerly chemist to the War Office, and consulting chemist to the Royal Gunpowder Factory, Waltham Abbey £50,395

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Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.

EGAN, Mr. T. F., 106, Northfield Avenue, Ealing, chemist.

(C.C., 28/10/22.) £10 38. 4d. September 18.

CARDNO, Mr. J. A., 93, Bruce Grove, Tottenham, chemist. (C.C., 28/10/22.) £10 128. 3d. September 21.

GRUBB, Frederick William, 38, Nightingale Road, Southsea, chemist. (C.C., 28/10/22.) £13 188. 10d. September 6.

STANSFIELD, Mr. J. L., Boothfoot, Waterfoot, chemical manufacturer. (C.C., 28/10/22.) £10 188. 11d., September 22. and (12 108 14. September 15. 23; and £12 ios. id., September 15.

Deed of Arrangement

BARRITT, Eduard Coventry, 459, Harrow Road, W., chemist and druggist. (D.A., 28/10/22.) Filed October 20. Assignment upon trust, etc., including interest in partnership business carried on at 459, Harrow Road. Trustee, P. S. Booth, 14-17, Holborn Viaduct, E.C., accountant. Liabilities unsecured, £610; assets, less secured claims, £213

Receivership

M. RENIER AND CO., LTD. (R., 28/10/22.) E. L. Pack, of 3, Iddesleigh House, Caxton Street, Westminster, was appointed receiver on October 7, under powers contained in debenture dated September 1, 1922.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given-marked with an *-followed by the date of the Summary, but such total may have been reduced.]

BANN (ARTHUR), LTD., Stockport, chemists. NN (ARTHUR), LTD., Stockport, chemists, [al., 28/10/22.) Registered October 9, £3,000 debenture and mortgage collateral thereto, to C. E. Hazeldine, Freshfield, Egerton Road, Southport, student; general charge, and 48, Castle Street, Edgeley. *Nil. March 1, 1922.

and 48, Castle Street, Edgeley. *Nil. March 1, 1922.

EVANS SONS LESCHER Al D WEBB LTD., Liverpool, manufacturing chemists. (M., 28/10/22.) Registered October 6, Trust Deed dated September 25, 1922 (supplemental to Trust Deed dated November 21, 1902), increasing rate of interest payable on £100,000 debenture stock of which £52,000 is outstanding, and securing a premium of £2 10s. per cent. on redemption; charged on certain properties specified in original Trust Deed, and further properties known as 47, 48, 49, 50-53, Bartholomew Close, E.C., also general charge. *£138,000. May 12, 1922.

Satisfaction

ROWE (WALTER), LTD., Leicester, chemists. (M.S., 28/10/22.) Registered October 12, £1,750 mortgage, to Leicester Permanent Building Society; charged on Eldon House, 97, London Road, Leicester. *Nil. December 19, 1921

London Gazette

Notices of Intended Dividends

HEESCH, Ernest Edwin Ferdinand, Stansfield Mill Yard. 77 and 79, Kirkstall Road, Leeds, oxy-acetylene welder and chemical manufacturer. Last day for receiving proofs, November 8. Trustee, H. C. Bowling, Official Receiver, 24, Bond Street, Leeds.

WILLIAMS, William Eleder, 12, High Street, Swansea, chemist and druggist. Last day for receiving proofs, November 4. Trustee, H. Rees, Official Receiver, Government Buildings, St. Mary's Street, Swansea.

New Companies Registered

BRISTOL CARBIDE CO., LTD. Manufacturers of and dealers in carbide of calcium and products arising therefrom, electric plant, etc. Nominal capital, £500 in £1 shares. A director: Mrs. E. A. Bingham, 2, Kingswood

Road, Upper Norwood, S.E.

JAMES MILLER, SON AND CO., LTD., 79, West Hill
Street, Glasgow. Chemical and general merchants,
drysalters, etc. Nominal capital, £100,000 in £1 shares.
NEWCASTLE CARBIDE CO., LTD., Room 223, Mansion

House Chambers, 11, Queen Victoria Street, London. Manufacturers of and dealers in calcium carbide, electrochemical products and apparatus, etc. Nominal capital,

£500 in £1 shares.

PRICKLY PEAR PRODUCTS (PROPRIETARY) LTD.,
Manufacturers of and dealers in chemical preparations poisons and sprays for the treatment of noxious and other plants, trees, and growths, including the prickly pear plant, etc. Nominal capital, £15,000 in £1 shares. A subscriber: J. Bell White, 5, King's Bench Walk, E.C. Directors to be appointed by the subscribers.

RATINOL CO., LTD., 30, Mark Lane, E.C. Manufacturers and distributors of preparations for the extermination of

rats and other vermin. Nominal capital, £5,000 in 4,500 preferred ordinary shares of £1 each and 10,000

ordinary shares of 1s. each.

ROAD DEVELOPMENT CO., LTD. Importers and exporters of and dealers in tar, bitumen, stone, granite, etc.

Nominal capital, £1,200 in £1 shares. A director: F. Ward,
36, High Street, Croydon.

Anti-Corrosive Products Preliminary Meeting of Proposed Association

Arrangements have been made for a preliminary meeting in connection with the proposed Association of Manufacturers of Non-Corrodible and Anti-Corrosive Products to be held at Caxton Hall, Victoria Street, Westminster, on October 31 at The promoters point out that if all iron and steel articles in which corrosion is the predominating factor that influences depreciation—as, for instance, pipe lines, ships, containers, cables, pulley blocks, structures, and the like—were constructed of non-corrodible material permanently protected by anti-corrosive processes, a greater proportion of Britain's iron and steel output could be released to meet the ever-growing demands for machinery and mechanical appliances in which friction is one of the main destructive factors. In addition to work on the lines previously indicated it is intended that the proposed Association should have a permanent exhibition of non-corrodible and anti-corrosive

Intimations that they are in principle in favour of the establishment of the Association, and that they will be represented at the preliminary meeting, have been received from the following:—Frederick Allen and Sons (Poplar), Ltd.; D. Anderson and Son, Ltd.; The Atlas Preservative Co., Ltd.; Col N. T. Belaiew; Mr. George L. Benbough; Mr. G. B. Bengough (representing the Corrosion Research Committee of the Institute of Metals); The Better Products Co.; Bitulac, Ltd.; The British Cast Iron Research Association; The Chesebrough Manufacturing Co.; The Clerkenwell Plating Works; Mr. S. Cowper-Coles; Cuirass Products, Ltd.; The Damard Lacquer Co., Ltd.; Evans King and Co.; Fenton Brothers, Ltd.; Thomas Firth and Sons, Ltd.; Dr. J. Newton Friend; The Galvanizing Equipment Co., Ltd.; Mr. Frank Gilman; Thomas Howse, Ltd.; The Indestructible Paint Co., Ltd.; Jenson and Nicholson, Ltd.; The Lennox Foundry Co., Ltd.; McVicker, Morris and Co., Ltd.; Meldrums, Ltd.; National Alloys, Ltd.; Plaster Paint, Ltd.; Arthur Ross, Hotchkiss and Co., Ltd.; The "R.P." Co.; The Rustless Iron Co., Ltd.; Sanstain, Ltd.; Mr. W. Nelson Smith; Walter Spencer and Co., Ltd.; Mr. W. Nelson Smith; Walter Spencer and Co., Ltd.; The Stainless and Non-Corresive Metal Co.; Stannic, Ltd.; Edgar Vaughan and Co., Ltd.; Henry Wiggin and Co., Ltd.
The organiser of the Association is Mr. W. R. Douglas.

Shaw, with temporary offices at 84, Baker Street, London, W.I.

